**In This Issue** — Present Status of Railway Electrification

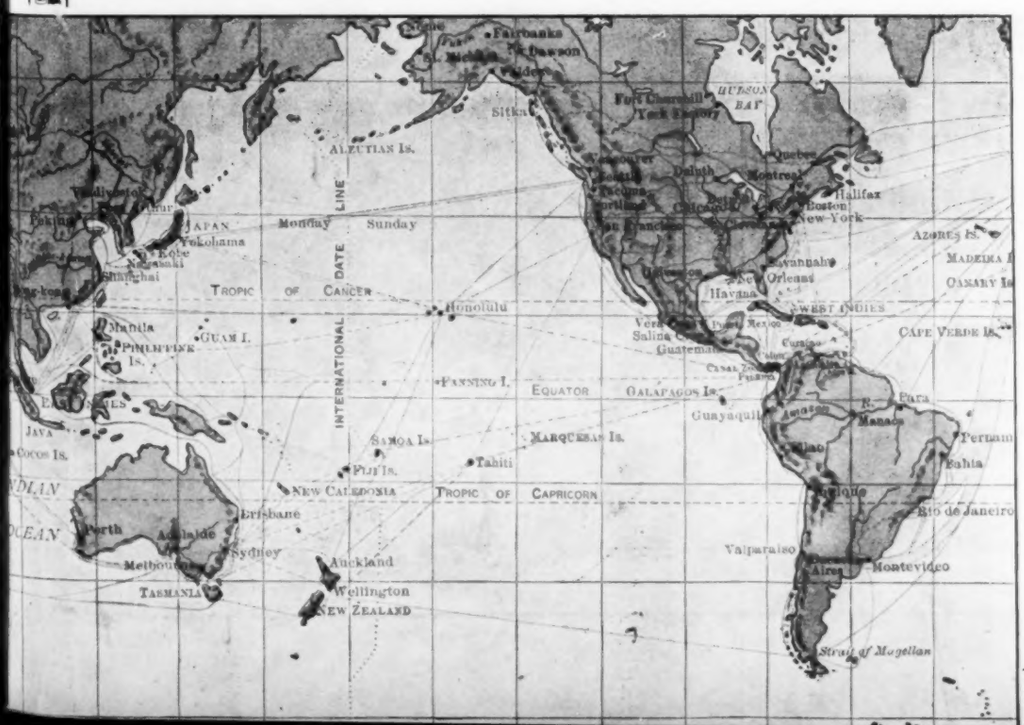
# JOURNAL OF ELECTRICITY

VOL. XXXIX NO. 11 SAN FRANCISCO, DECEMBER 1, 1917 PER COPY, 25 CENTS

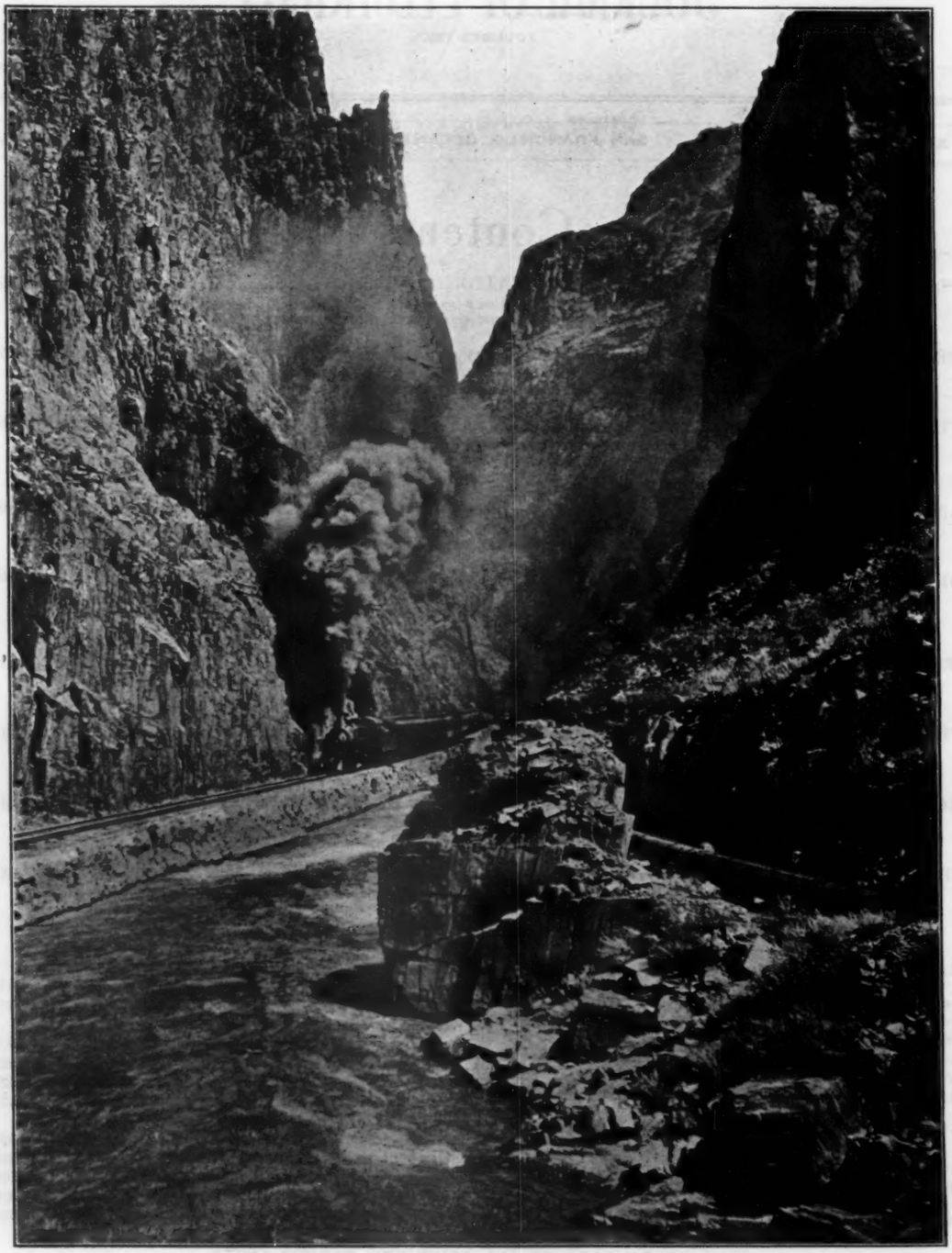
# Greetings

AS this issue of the Journal of Electricity goes out to every important port in the countries bordering the Pacific Ocean, it carries with it greetings from men of the electrical industry of the United States. In this the thirtieth year of its service to the upbuilding of the electrical industry, the Journal of Electricity now extends to you electrical men who dwell in every port and clime of the Pacific the message of good will recently unanimously passed by a gathering of prominent men from every branch of the industry in the United States of America:

"Be It Resolved, That the President of this gathering of electrical men is hereby authorized to communicate with organizations of a similar nature both in cities of the Pacific States of America and in the countries that line the great Pacific Ocean, to express to them friendly greetings and the desire of this organization to do everything within its power to forward friendly commercial and engineering relations with all the neighboring countries that line its borders—commercial and engineering relations that will be so helpful in character and so free from a spirit of domination as to unite forever these great growing countries into one indissoluble chain of mutual helpfulness."




A written word of approbation from you endorsing the spirit of this movement addressed to the President of the League, care Journal of Electricity, San Francisco, will help in giving this movement a substantial start and aid in the early calling together of a Pan-Pacific Committee for discussing problems of standardization in commercial and engineering practice.



## HOW THE WEST IS HELPING TO WIN THE WAR—III

Thoughtful study in railway electrification and in possible saving of fuel is being made throughout the massive passes of the great mountain railroad divisions of the West, looking toward a utilization of the giant water powers that trail their way beside the transcontinental systems which are now steam operated. Though a task of this magni‘ude must of necessity take much time—perhaps years—for its consummation, yet in the ultimate, the resulting saving in fuel supply can hardly be overestimated in its effect upon the commerce and industry of the world.

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JOURNAL OF ELECTRICITY

DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

VOLUME XXXIX SAN FRANCISCO, DECEMBER 1, 1917 NUMBER 11

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# The Christmas Electrical

**The very word "electrical" connotes to the thinking mind a subtle, energizing, thrilling, life-giving something that no other word in the articulation of the human tongue can transmit. In these strenuous times, when need is felt on all sides so keenly for a revitalizing, cheering influence, can not we as members of a great industry, along with our splendid array of material ware that we send out to an admiring and appreciative world, reflect more and more in our every act the very mind picture of the electrical season of the year in which we live, and thus transmit the spontaneity and life-giving cheer that can be expressed alone in but three words of the English Language — The Christmas Electrical.**

## War Service Committee in California

The President of the United States and the National Council of Defense have frequently called attention to the necessity of conservation of fuel.

Throughout practically the entire West a shortage in power supply to meet the vast demands now placed upon the industrial activities of this section, combined with the approaching dangers of a fuel shortage especially in crude petroleum, have led thoughtful men of the industry to question as to how best true conservation of hydroelectric power may be brought about.

This discussion of how best to "hooverize" electrical energy finally reached its climax at a recent gathering of men of the electrical industry in central California. Acting as hosts for the occasion the San Francisco Electrical Development and Jovian League invited the California Railroad Commission, including its electrical engineer, to be guests at a mass meeting of men of the industry in the Palace Hotel. The meeting was a large and enthusiastic one. Talks made at the luncheon dealt with the closer co-operation of the producers of electricity and the Railroad Commission in meeting the new problems of public service raised by the war emergency.

These two things were emphasized by the speakers:

1—There is a very narrow margin between the supply and the demand for electricity in the West, and consumers generally should join in conserving it in every practical way.

2—The recent order of H. A. Garfield, United States Fuel Administrator, restricting the use of street display lights after certain hours, does not apply to districts where electricity is produced by water power and oil fuel and is not dependent on coal, as it is in many Eastern communities.

President Thelen of the Railroad Commission said that an effort should be made in California to conserve fuel oil, the supply not being equal to the demand. Hydroelectric power, he said, should be developed to the highest point to supplant the use of fuel oil.

Continuing, Mr. Thelen said that the thing most needed is a careful survey of the field of electric energy from the viewpoint of what can be done to help the United States and to make the electrical generating companies — the producers — more helpful in the nation's task of winning the war.

Mr. Thelen suggested the appointment of a special committee to make the survey and to outline methods for closer co-operation between the producers and the Railroad Commission in meeting public service problems during the war.

In accord with the suggestion from the Railroad Commission and also in accord with the spirit of the meeting the following resolution was unanimously passed:

"Whereas, the San Francisco Electrical Development and Jovian League has as one of the objects of its existence 'to encourage a more extensive use of electricity and to generally promote the welfare of the electrical industry,' and

"Whereas, the President of the United States and the Council of Defense, have frequently called attention to the necessity of conservation of fuel;

"Therefore, Be It Resolved, That the Railroad Commission of California be requested to appoint a War Service Committee of which a member of the California Railroad Commission and a representative of the electrical engineering staff of the commission shall be members, to look into the hydroelectric situation of California and make definite, positive recommendations for interconnecting and co-ordinating

the hydroelectric lines of the State with the object of conserving fuel oil and of otherwise putting to the highest use the hydroelectric energies of the State for the public welfare."

The entire matter is one of vast public interest and it is to be hoped that similar action will be taken by men of the electrical industry in other commonwealths of the West.

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**Why Engineering Colleges are a Failure**

This editorial is written not with the purpose of indicting engineering educational method in the past but with the view of offering wholesome criticism for the broadening of this effort to meet the new world conditions now thrust upon us. In a word, its purpose is to point out a vastly broadened sphere of activity for the trained analytical mind. The question is, "Shall the engineer of the future grasp this great opportunity of service, or shall he retire to a narrow, limited field of purely technical practice that is largely mathematical, very limited in scope and of decreasing monetary remuneration?"

Prior to the opening of the great world war in 1914 engineers generally had viewed with considerable apprehension the growing difficulty of securing employment for the product of engineering colleges throughout the nation. Indeed this proved not only a problem for the younger men but among men of qualified standing in the engineering world much difficulty was experienced in securing positions in keeping with the financial dignity of the profession.

With the exigencies brought on by the present national crisis, an examination of the shortcomings of the product of engineering colleges has been made possible, and it is not difficult to offer suggestions as to how these shortcomings can be prevented in the future.

In the first place, the tremendous stride forward of the engineering profession during the past twenty years has vastly lessened the type of technical problems that formerly appeared for solution. In a word, the new era now upon us is wholly different from the one immediately preceding and as a consequence the engineering colleges of the country, pursuing the old line of curricula, must of a necessity prove failures in their preparation of young men for the solution of present-day problems.

To prepare analytical minds for the purpose of grappling with the truly engineering problems of the immediate future, the engineering colleges of the nation in general fail in giving these young men broad vision and in giving to the public the highest type of man best suited for the work in hand, because—

1. In general no selective system is used to pick men best suited for the task chosen as a life work. As a rule the student picks his course by considering only the lesser arguments—the passing popular vocation of the hour, because A has chosen it, or because father wants him to.

2. No attempt is made to place a reasonable limit upon the number that register in certain courses. In a word, the number of students in the various branches of engineering bears no relation at all to the need for men in the particular field chosen.

3. No well organized guiding, helpful hand is given for properly placing graduates in employment after the work is completed.

4. Physical shortcomings and general physical unfitness for the life work undertaken is given too little attention.

5. Great engineering managerial opportunities of the present day need men versed in economics, accounting, banking and commercial law. Our technical graduates are wofully lacking in these points.

6. There are comparatively few big, strictly technical positions open in the present day, consequently the great emphasis in the college curricula on mathematical specialties limits the field of usefulness of many who might otherwise succeed if well grounded in the fundamentals of economics and business law.

7. Total neglect of public speaking for engineering students is a most serious handicap in after life. Witness for instance the awful stillness that follows some of our engineering speeches, and the unfavorable impression created, although the speaker may be a man of significant engineering attainment.

8. Little if any training in foreign languages is given in our engineering colleges. The need of the hour in the great international opportunities ahead calls for their use. Hence this is again a great handicap.

9. Written expression receives little attention in the engineering curricula and as for encouragement in technical writing, only a few students ever feel its invigorating influence.

10. Efficiency and method study are two prime factors in the success of the modern engineer. By far too little attention is given to this most important subject.

It is true that the years of college are all too limited for establishing the foundation work necessary for the high calling of the engineer of the future. But above all it must be remembered that the age in which the next generation is to live will be one in which an accurate business training is absolutely essential. Unless this fact is borne in mind and business methods and economic principles are inculcated into our young engineers our technical colleges must perforce prove failures in their high calling.

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**Engineering in the Pan-Pacific Area**

New ideas of engineering and commercial growth are constantly being brought forth. The closer drawing together of the nations that line the great Pacific has been receiving the thoughtful attention of many master minds during recent months. That the Pacific Ocean is to be the great arena for commercial activity in the coming generation is rarely denied by men who have given thoughtful study to the possibility of development in the growing countries that line its borders.

Engineers and commercial men of the Pacific States of America are keenly awake to this fact. The only problem that is perplexing is as to how the building of commercial and engineering relations shall be accomplished in order that the peace of the world may result and a permanency in this building status maintained.

Up and down the Pacific Coast and in the great cities of the interior, gatherings of engineers and men

of the industry interested in this problem, which means so much to the future life of the West, are discussing this matter.

That these relations should be built upon broad lines is conceded by all. In its last analysis competition means war and it ought to cease. To bring this about the development of the highest and truest spirit of co-operation attainable among engineers and commercial men of the Pan-Pacific Area is absolutely essential.

Let us remember, then, that co-operation in every human endeavor is the keynote of the hour. Can not we all subscribe to the principles expressed in a recent resolution by a large gathering of men of the electrical industry in the west which briefed the entire matter so beautifully, as follows:

**"Be It Resolved, That the President of this Electrical Development League is hereby authorized to communicate with organizations of a similar nature both in cities of the Pacific States of America and in the countries that line the great Pacific Ocean, to express to them friendly greetings and the desire of this organization to do everything within its power to forward friendly commercial and engineering relations with all the neighboring countries that line its borders—commercial and engineering relations that will be so helpful in character and so free from a spirit of domination as to unite forever these great growing countries into one indissoluble chain of mutual helpfulness."**

Copies of these resolutions are now being sent to every port in the great Pacific Area. Already several similar organizations in Pacific Coast cities have indicated their willingness to subscribe to the principles set forth in these resolutions.

The time is not far distant when a congress or convention may be called to consider many points that will make these resolutions of concrete helpfulness. Standardization of engineering and commercial practice is one problem that is the crying need of the hour and a committee from the various countries bordering the Pacific could do much in laying down the first fundamentals for meeting this great need.

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**The Electrification Problem**

One extremely interesting development due to the present world stress is the unquestioned exposure of the economic fallacy of separately operated units in power generation. The railway problem is another phase of this great present-day trend that is receiving much thought and study, and the one outstanding giant feature of this problem is the future electrification of the railways of the nation—especially those that cross the mountain passes or through districts where abundance of water power is available.

It is true that the sum of money to electrify a great system such for instance as would be necessary for the complete electrification of the Southern Pacific Lines is sufficient to stagger the imagination, still the public at large has now become used to thinking and talking in figures that formerly seemed unthinkable.

The whole world thought is in a state of flux. The one general principle to lay down from which to discuss present-day problems is "Does the proposed scheme meet an economic need for the people as a whole?"

On another page of this issue authentic data are set forth showing the results that have been accomplished by the electrification of the mountain division of the Chicago, Milwaukee and Puget Sound Railroad and also similar data from the operating costs of the Norfolk & Western Railroad.

With the conclusion of the world war vast armies of men are to readjust themselves and find avenues of support.

So long as Mother Earth is productive and so long as human brains and human hands stand ready to forward the highest economic development of the race no outlay in mere commercial exchange need bar the undertaking of a human task.

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**The Saving of Waste Power in the Industries**

The husbanding of waste energies is taking place in industrial institutions of the West to a degree hitherto unthought of as possible.

Perhaps no other problem has received more careful consideration than the enormous waste of heat energy carried away in the spent gases of the steam engine and the gas engine. Since the days of Carnot it has been thought that the irreversible cycle of the internal combustion engine made necessary the forever giving up of a hope that some inventor would some day recover the 60 to 80% waste energies of this type of prime mover.

While the irreversibility of the Carnot cycle is as true today in the theory of Thermodynamics as ever, still it is surprising to what limits waste energies of this nature are being recovered.

Take the case of the new industrial installation of the Hawaiian Sugar Refinery at Crockett, California, as an example. In this plant approximately two and one-half million dollars are being spent in refined improvements for power applications.

On January 1, 1918, the company will start the erection of a 4500 kw. generating plant, as it is estimated that it will prove cheaper to generate its own power than to purchase power from the great hydro-electric companies that serve the district.

This unique condition is brought about in the manufacture of sugar as every pound of exhaust steam from the steam turbines may be efficiently made use of in the refining process.

It is to be hoped that the gigantic losses in exhaust steam, commonly 60 to 80 per cent as stated above, can be more the subject of investigation. Such savings are indeed the higher class of conservation, for like the "ninety and nine" of old the one stray sheep brought again to the fold causes great rejoicing and incidentally a clear profit of 100% to the power user.

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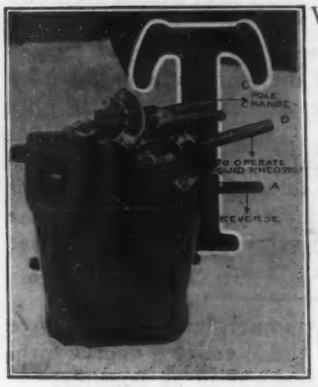
**THE NEW JOURNAL SERVICE:** The Journal of Electricity is now ready to announce the opening of an important type of Journal service. As stated in the editorial columns of the issue for Sept. 15, 1917, an employment department has now been put in full operation. Complete details of this interesting new work will be found on another page of this issue.

With this issue another feature is also added to our editorial and advertising pages. In order to acquaint our readers with important items of interest connected with the activities of the Journal's advertisers, a tie-in page between the editorial and advertising pages of the Journal has been added. This page is highly educative in value and should prove helpful to men of the industry in grasping a clearer view of the interesting and important lines carried by those using the advertising columns of the Journal, who may well be classed as national leaders in their respective lines of activity.

# PRESENT STATUS OF RAILWAY ELECTRIFICATION

*(The electrification of the railways of the nation is a problem that involves factors of such gigantic magnitude as to almost stagger the imagination. Yet the possible economic returns in conservation of coal and fuel oil combined with vast superiorities from almost every other conceivable viewpoint force thoughtful men to view with unusual interest the returns of records from present electrified lines throughout the nation. Here is authentic information on this subject which should prove of intense interest to our readers and of much timely import.—The Editor.)*



The Master Controller on the Norfolk & Western Lines

TWO great railway electrifications have been followed with unusual interest during the past year by engineers generally. The Chicago, Milwaukee and Puget Sound Railway with its beautiful crossing of the high Rockies under electric propulsion has received frequent comment in the columns of the Journal of Electricity. In the issue for March 1, 1917, there appeared an article on the Norfolk & Western Railway electrification by A. H. Babcock, consulting engineer for the Southern Pacific Company, that has received nation-wide attention.

Since these various articles have appeared in the columns of the Journal of Electricity considerable investigation and inquiry have been made as to the actual costs of operation and maintenance of these two great systems of electrification. The executives of these organizations have been communicated with and the results of the inquiry have proven most illuminating. The information secured by the Mercantile National Bank of San Francisco, a correspondent of The National City Bank of New York, is interesting and timely. A few months back this banking institution gave out a statement from the superintendent of motive power of the Pennsylvania Railroad Company, showing that within the last five years that company has practically doubled the coal efficiency of its locomotives, at an increase of about 30 per cent in capital cost. Pursuing the same line of inquiry, to the substitution of hydro-electric power for steam power, a statement was given out from Vice-President Goodnow, of the Chicago, Milwaukee & St. Paul Railway Company, upon the results of electrical propulsion over its Rocky Mountain division, in October, November and December, 1916, as compared with steam propulsion in the corresponding months of 1915.

The statement does not go into comparative costs in dollars and cents, which would be a very complicated calculation, but that a conclusion has been reached favorable to electricity, at least under similar conditions, is evident from the fact that the company is now installing electrical equipment on its Cascades division.

The facts given by Mr. Goodnow show that electricity is decidedly superior to steam in operating efficiency, especially in cold weather, and if the use of electric power increases the capacity of a road, enabling more trains to be operated over the same tracks, of course that fact is a very important element in the total cost of supplying transportation. The superintendent of the Rocky Mountain division has expressed the opinion that to have handled the traffic in the winter of 1916 without electricity, double tracking would have been necessary.

In this connection it may be added that an important consideration in the decision of the Pennsylvania Railroad Company to electrify its suburban service between Philadelphia and Paoli was the fact that it could thereby avoid a costly enlargement of its Philadelphia terminal.

An interesting feature of electrical propulsion is the fact that 11.3 per cent of the power consumed during the months under review was generated by the trains themselves on the down grades, but Mr. Goodnow says that this regeneration is reckoned as of minor importance compared with the ease and safety

Electric Locomotives on the Chicago, Milwaukee & Puget Sound Railway

The "Olympian" entering a Montana Canyon. This train is electrically operated and equipped throughout

of handling the trains on grades, and the lessened wear and tear on equipment. Other authorities say that the most valuable feature of this power generation is the "dynamic breaking," or the holding of the train at a uniform speed on down grades without the use of air brakes. Longer and heavier trains and greater speed are possible than with the use of air brakes.

The summary of the record of steam and electric operation in the periods under comparison is given below:

ber, 1916; item No. 7 for passenger service and item No. 20 gives the same information for through-freight service. The figures do not include coal used for switching or work trains, which figures I have not conveniently available. Item No. 5 of this table also gives the kilowatt hours used for passenger service, and item No. 18 gives the same information for through-freight service.

I might state, however, in this connection that the question of relative cost of fuel is only one of a good many items which affect the question of relative

**CHICAGO, MILWAUKEE & ST. PAUL RAILWAY CO.**
**Electrification Department**

Data on Operation Under Steam in 1915, and Under Electricity in 1916

| | Rocky Mountain Division | October | | November | | December | | Total | |
|---|---|---|---|---|---|---|---|---|---|
| | Passenger | Steam | Electr. | Steam | Electr. | Steam | Electr. | Steam | Electr. |
| 1 | Train or Train Engine Miles | 39,426 | 40,169 | 41,276 | 40,549 | 38,628 | 38,519 | 119,330 | 119,237 |
| 2 | Helper Engine Miles | 4,738 | ..... | 7,966 | ..... | 12,048 | ..... | 24,752 | ..... |
| 3 | Number Engines | 13 | 7 | 13 | 7 | 13 | 7 | 13 | 7 |
| 4 | Train Miles per Engine | 3,040 | 5,730 | 3,180 | 5,800 | 2,970 | 5,510 | 9,190 | 17,040 |
| 5 | 1,000 K.W.H. at Power Co.'s Meters | ..... | 1,217 | ..... | 1109.5 | ..... | 1,152 | ..... | 3478.5 |
| 6 | K.W.H. per Train Mile | ..... | 30.3 | ..... | 27.4 | ..... | 29.9 | ..... | 29.1 |
| 7 | Coal, Total Tons | 3,380 | ..... | 4,150 | ..... | 3,739 | ..... | 11,260 | ..... |
| 8 | Coal, Pounds per Train Mile | 171 | ..... | 201 | ..... | 193 | ..... | 188 | ..... |
| | Freight | | | | | | | | |
| 9 | 1,000 Ton Miles | 98,512 | 125,522 | 93,228 | 130,848 | 91,122 | 107,717 | 282,862 | 364,087 |
| 10 | Train Miles | 60,666 | 65,400 | 58,014 | 63,299 | 58,257 | 57,311 | 176,937 | 186,010 |
| 11 | Helper Engine Miles | 16,605 | 7,022 | 20,422 | 7,544 | 19,336 | 5,591 | 56,363 | 20,157 |
| 12 | Number Engines | 42 | 15 | 41 | 15 | 44 | 15 | 43 | 15 |
| 13 | 1,000 Ton Miles per Engine | 2,405 | 8,370 | 2,270 | 8,720 | 2,070 | 7,170 | 6,745 | 24,260 |
| 14° | Number Subdivision Trains | 535 | 585 | 523 | 583 | 526 | 543 | 1,584 | 1,711 |
| 15* | Ton Miles per Train Mile | 1,625 | 1,920 | 1,605 | 2,070 | 1,563 | 1,880 | 1,600 | 1,960 |
| 16 | Total Time, Hours | 6,094 | 5,022 | 5,946 | 5,084 | 5,785 | 4,429 | 17,825 | 14,535 |
| 17 | Minutes per 1,000 Ton Miles | 3.70 | 2.40 | 3.83 | 2.38 | 3.81 | 2.47 | 3.78 | 2.39 |
| 18 | 1,000 K.W.H. at Power Co.'s Meters | ..... | 4,696 | ..... | 5,119 | ..... | 4,528 | ..... | 14,343 |
| 19 | K.W.H. per 1,000 Ton Miles | ..... | 37.4 | ..... | 39.1 | ..... | 42.0 | ..... | 39.4 |
| 20 | Total Tons Coal | 12,150 | ..... | 13,670 | ..... | 13,230 | ..... | 39,050 | ..... |
| 21 | Pounds Coal per 1,000 Ton Miles | 247 | ..... | 294 | ..... | 291 | ..... | 276 | ..... |

°"Subdivision Train"—One train over one Subdivision: Divide by 2 for trains over entire Division.

*"Ton-Miles per Engine-Mile" equals tons per train with one electric engine and short helper service, or with one steam engine and longer helper service. In this connection consider Item 17.

Total Regeneration over entire Division, month of November, equals 11.3% of consumption at motors.

Passenger on 2% grade, January 21-27, 1917—Regeneration = 42.8% of consumption at motors.

Passenger on 1.66% grade, January 21-27, 1917—Renegeration = 23.1% of consumption at motors.

### Statement by Vice-President Goodnow

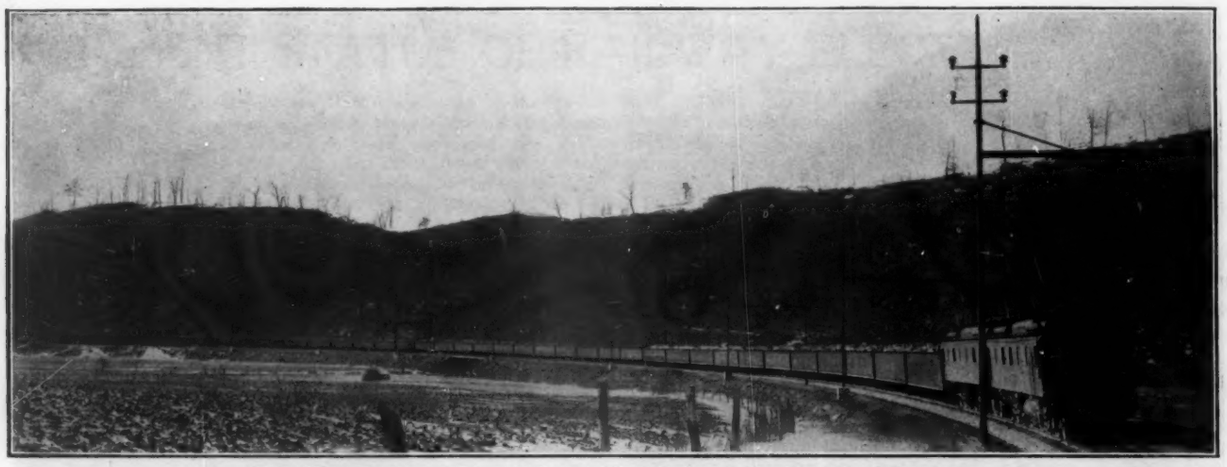
Chicago, August 31st, 1917.

The National City Bank,
New York City, N. Y.

Gentlemen:—

Referring to your letter of August 6th, I attach hereto a blueprint which shows you the approximate tons of coal used for October, November and December, 1916, and the comparative economies under steam vs. electric operation, as I believe the following will indicate to you:

In the first place, although the figures shown on the blueprint show up favorably for electrical operation, they can by no means be considered as final, inasmuch as the comparative figures for steam operation represent the results of many years of effort and experience, while the figures for electricity are based



How Giant Haulage is Accomplished Electrically on the Norfolk & Western

on the use of apparatus and a system which is entirely new in many respects, and at the time the figures were prepared, on an operating experience of less than one year. The figures are given for the Rocky Mountain Division only, as they have not been compiled in a similar manner for our Missoula Division.

Harlowton is the eastern terminus of the Rocky Mountain Division, and is the station where electric operation begins. Deer Lodge is the western terminus of this division, while Three Forks, located about midway between the two above named points, was formerly a steam engine division point. Under steam operation, train engines were changed at Deer Lodge, Three Forks and Harlowton. Thus, a steam locomotive made about 113 continuous miles. At the end of that run it was put in the roundhouse or shop to have it cleaned, boilers washed, etc., and for any light repairs. This necessitated a large roundhouse and shop force at each of the three above mentioned points. Freight trains were tied up in the yards and there were the usual other costly and vexatious delays. All train and engine crews changed at each of the through subdivision points mentioned, except passenger train crews which ran from Deer Lodge through to Harlowton. Under steam, the cabooses and many of the engines were assigned which of course made it necessary to take the caboose from the train at each subdivision point.

With the introduction of electricity we were able to double what I may call the cruising radius of our locomotives. As far as the railroad is concerned, we have eliminated Three Forks entirely. All locomotives run the entire 226 miles from Deer Lodge through to Harlowton with only a light inspection at Three Forks of bearings and pantographs. The shop and roundhouse are entirely closed down, seven or eight miles of tracks have been removed and the comparatively large roundhouse force previously employed has been replaced by a single electrician. All locomotives and cabooses are pooled, the men being given suitable locker space to store their lanterns, flags, tools, etc. Through freight trains do not leave the main track and often are not switched at all. At Harlowton the engine is given a rough inspection and any light repairs made that are necessary. Detailed inspection and maintenance work is done at Deer Lodge.

The same change in operation as referred to above has been effected on the Missoula Division, Avery to Deer Lodge; in this case Alberton being the steam engine division point eliminated.

The blueprint being sent you also shows for the Rocky Mountain Division a comparison of locomotive performance for October, November and December, under steam operation in 1915, and electric operation in 1916. It should be understood that the figures given, while sufficiently correct for comparative purposes, as they are taken from the same report forms, are not to be considered as strictly accurate when considered individually, the forms being those from which the data could most conveniently be obtained.

Item No. 2 on the blueprint shows that helper engine miles increased under steam as the temperature decreased, this being due to the difficulty of "steaming" the locomotives during extremely cold weather and making it necessary to operate helper engines in connection with passenger trains, over long distances. This helper service for passenger trains, with its extra crew cost, switching delays, etc., has been eliminated under electricity.

By reference to item No. 3 on the print, showing the relative number of engines required for electric vs. steam operation, you will note that less than half as many electric locomotives are required compared with steam engines, for the same service.

Item No. 9 under freight data, "Thousands of Ton Miles" shows an average increase during the months of electric operation of 28.8 per cent over that of steam. For November the increase was 40 per cent. In this connection the superintendent of the division has stated that to handle the 1916 business, either electrification, or with steam,—double tracking, was necessary. The latter would of course have required extra motive power. Possibly the superintendent did not intend his statement should be taken literally, but in any event it is reasonable to assume that under the business conditions which existed during the period under consideration, and the resulting congestion, the steam figures would be, for steam, too favorable.

Item No. 11 indicates that under freight service and for the same ton miles, there would be over three times as many helper engine miles under steam as

under electricity, the cause for this being due largely to the same conditions as applied under passenger service.

Using the figures as they stand, we find from item No. 13, "Thousands of Ton Miles per Engine," that the electric engine handles about 3½ times as many ton miles per month as the steam engine, and from item No. 17, "Minutes per Thousand Ton Miles," that the electric engine cuts from the time to do a given business, 30 per cent, partly by faster running and partly by heavier trains.

Item No. 15, "Ton Miles per Train Mile," is about the same as tons per train, and 22 per cent greater for electricity than steam.

As to the effects of regeneration on the power consumption, it will be noted that for the month of November, the amount of regenerated power measured at the locomotives was 11.3 per cent of the total power consumed at the motors. I may say, however, that the power saving features of regeneration is not considered so important by us as the increased safety and ease with which trains are handled on the heavy mountain grades and the saving in wear and tear on brake shoes and equipment.

Truly yours,

C. A. GOODNOW, Vice-President.

**Norfolk and Western Railway**

The Norfolk & Western Railway has been operating for over a year with electric power over 29 miles of heavy grades upon its Pocohontas division, which includes the passage over the Allegheny Mountains. It has a heavy coal movement to handle. The company has made a statement about its experience with electric propulsion, from which we take the following:

"In the development of this business the company has taken advantage of all modern methods in steam traction, in respect to the use of maximum weight trains and the most powerful type of locomotives, and has thus reduced the movements over the division to a minimum. But it was found that track capacity was frequently reached in normal service and that growth of business could be cared for only by very expensive physical reconstruction. Careful study of the possibilities and economy of electric traction for these special conditions resulted in the conclusion that it would be practicable to increase the train speed greatly and that this, together with the elimination of delays occasioned by coaling and watering of steam locomotives, would enable a greatly increased tonnage to be handled at a reduction in operating cost which would return a substantial profit above interest and depreciation charges on the electric equipment, thus postponing the necessity for new trackage and other additions which would not directly reduce operating costs.

" . . . Twelve electric locomotives have been provided for the service, replacing thirty-four Mallet steam locomotives. Each electric locomotive consists of two units weighing 135 tons, giving a total weight of 270 tons for the complete locomotive.

"Electric operation has been in service too short a time to give data as to performance, but it may be said that the estimates of increased capacity to be obtained from this equipment have been fully met and that an unusually heavy tonnage has already been handled without congestion. The movement of the heavy tonnage trains by electricity has been effected with ease and smoothness; the trains accelerate promptly and without shock or jerk on the heavy grades, and it has been found that the full trains can be smoothly controlled by one head engine on the 2.5 per cent down grade by electric braking alone and at a uniform speed slightly above that of the regular running speed. The acceleration of one of these heavy trains is impressive as regards the amount of power required. Preliminary tests indicate that getting a train in motion up the grade requires as much as 11,000 electrical horsepower and that running at uniform speed up the grade requires 8,000 electrical horsepower to be delivered to the train. It is believed that no such amount of power has ever before been developed on a single train, either steam or electric, in regular service."

**Railway Electrification After the War**

The possibilities of railway electrification are especially interesting at this time, because they suggest a vast field open for construction work in this country and throughout the world, as soon as capital and labor can be had for it. There is naturally a feeling of uncertainty and apprehension as to industrial conditions after the war. The demand for war materials will fall off, the supply of labor on the market will be greatly increased, and it is a question whether all of this labor can be promptly placed in employment. It will be the most stupendous reorganization of industry ever known, and it is going to be a great social problem to accomplish this change without confusion, loss of confidence, and a period of stagnation. It is important that plans be laid on a large scale to take up the slack, and other countries are laying them. In this country, ready at hand, is the task of equipping the railroads, and other industries where practicable, to operate by electric power. The undertaking would involve an enormous amount of work and of many kinds. Hydro-electric plants would require in construction a great amount of labor, cement, steel, and heavy machinery. The demand for copper would take the place of the war demand for that metal, and keep the copper mines busy. The demand for electrical equipment of all kinds, including locomotives, would be very great, for the enlargement of the facilities for supplying electric power would cause electricity to be more generally adopted for all the industries. The amount of work in sight, if a general scheme of electrification was undertaken, would be sufficient to relieve the business community.

The danger will be in a pervasive feeling of uncertainty, causing men to wait with their own plans until they can discern the general trend, and waiting of itself slows down business. Large plans for the employment of labor which can be brought definitely forward at the critical time will serve to inspire confidence and support the whole situation.

The strength of the proposal is in the great amount of work of a semi-public character which it is possible to have done, and which would not only tide the country over the period of industrial uncertainty, but serve to put the country's industries upon a more economical basis permanently. Any reduction in the cost of power will strengthen the country's position in the competitive situation after the war. Every saving of this character will lessen the necessity for wage reductions after the war.

# REDUCING SEEPAGE IN EARTH RESERVOIRS

BY S. T. HARDING

*(Where the water furnished by the electrical pumps is not put into immediate use, the earth reservoir has come to be an essential factor in the equipment. The following article is therefore of timely interest, by an author who as irrigation investigator at the University of California, may be looked upon as an authority in this field.—The Editor.)*

A small unlined reservoir used with a farm pumping plant

UNLESS constructed in fairly heavy soil some methods of treatment of earth reservoirs will be required in order to reduce seepage losses. The treatment may vary in extent and cost from a simple puddling of the soil in which the reservoir is excavated to the use of a concrete lining.

The rate of seepage loss in a reservoir must be much less than is permissible in earth canals. The area on which such loss occurs is relatively large and the rate of loss must be correspondingly reduced. A seepage loss of ½ or 1 cubic foot per square foot of wetted area per day would represent favorable conditions in canals, in shallow reservoirs such rates of loss would be excessive.

Seepage losses exceed evaporation losses for all but the most impervious types of lining. On single days when warm winds have been blowing, evaporation losses as great as ¾ of an inch per day have been observed in the San Joaquin Valley on large reservoirs. The average loss, however, is much less than this. Even though full only part of the time, the evaporation from small reservoirs is usually continuous, taking place from the saturated soil forming the site when water is withdrawn.

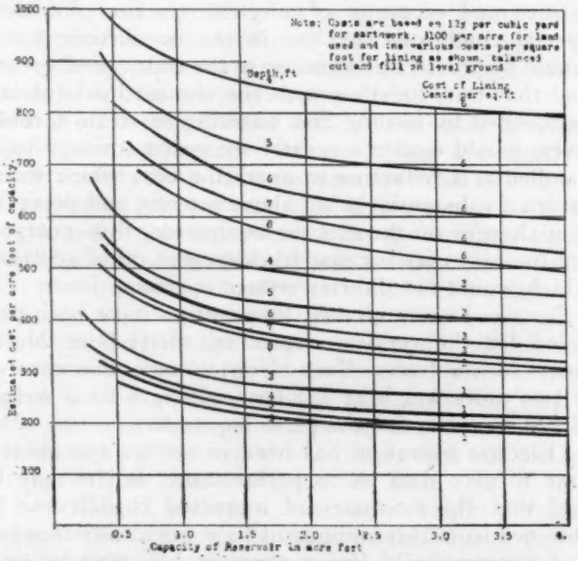
The rate of seepage through a soil can be reduced by changing its mechanical condition without adding any outside material. Heavy soils may be puddled when wet so as to be nearly impervious. Such puddling may be accomplished by trampling with stock, usually sheep, as their feet being sharper pack the soil more thoroughly. Dragging with a heavy chain or other similar means may also be used. Such puddling may not be permanent where frost action takes place, such frost action is not found, however, in most of the locations in which the use of reservoirs is general.

Where the soil is not sufficiently heavy to retain water itself, treatment with a layer of heavy soil, mixing of manure with the soil, or oil or concrete linings may be used.

A puddle lining may be applied to a reservoir at a relatively low cost if the material can be secured within reasonable limits of haul. Such linings are successfully used on canals where the conditions of slope and velocity are much more unfavorable than in reservoirs. For small reservoirs a thickness of lining of 6 inches is usual, in some cases 4 inches may give satisfaction if evenly spread. A cubic yard of material will cover 54 square feet 6 inches deep. To cover a reservoir having an area of 1 acre requires about 800 cubic yards if 6 inches thick and 540 cubic yards if 6 inches thick. Such puddle lining may cost less than 1 cent per square foot under favorable conditions of haul and placing. It is not generally used where the cost exceeds 1½ or 2 cents per square foot. At a cost of 1 cent per square foot it would cost about $150 to line an earth reservoir 100 by 100 by 4.

Seepage can be decreased by applying manure and working it into the surface. This may be used to render soils such as loams reasonably water tight. For lighter types of soils, such placing of manure may not reduce seepage sufficiently to be satisfactory.

Oil lining is being used on reservoirs with success in many instances. In other cases where not properly applied its effect has been only temporary. Oil linings have been tried on canals to reduce seepage and also on canals and canal banks to reduce vegetative growth. With canals such treatment has not generaly fulfilled the expectations of the canal owners. With reservoirs the conditions for permanence are more favorable and better results are being secured. Methods and costs of applying oil were discussed in the issue of April 1, 1917. In India, good results with oil linings were obtained by oil linings blanketed with a foot of earth to protect the oil. Labor costs in this country make this method too expensive, although such linings will reduce seepage and be fairly permanent. Oil linings as generally used can usually be applied at a cost of about 1 cent per square foot, the cost varying with the price of oil and the length of haul required.




Relative Cost per Acre Foot for Reservoirs of Different Capacities

**Table 1—Data on Small Lined Reservoirs**

| Size of Reservoir Inside at Bottom | Depth of Water | Capacity in Acre Feet | Capacity in Acre Feet | Capacity in Acre Feet | Estimated Cost of Reservoir Unlined | Estimated Cost of Reservoir Unlined | Estimated Cost of Reservoir Unlined | Estimated Cost of Lining | Estimated Cost of Lining | Estimated Cost of Lining | Estimated Total Cost | Estimated Total Cost | Estimated Total Cost | Estimated Total Cost per acre ft. | Estimated Total Cost per acre ft. | Estimated Total Cost per acre ft. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 x 50 | 4 | 0.33 | $ 58 | $ 55 | $ 113 | $342 | 0.31 | $ 50 | $ 158 | $ 208 | $670 | 0.29 | $ 47 | $ 260 | $ 307 | $1060 |
| | 5 | .45 | 75 | 63 | 138 | 307 | .41 | 64 | 167 | 231 | 562 | .38 | 57 | 292 | 349 | 917 |
| | 6 | .58 | 86 | 70 | 156 | 269 | .53 | 79 | 187 | 266 | 502 | .48 | 70 | 323 | 393 | 820 |
| 75 x 75 | 4 | .66 | 97 | 99 | 196 | 297 | .63 | 85 | 279 | 364 | 580 | .60 | 80 | 496 | 576 | 960 |
| | 5 | .88 | 120 | 108 | 228 | 259 | .83 | 97 | 298 | 395 | 476 | .77 | 99 | 540 | 639 | 830 |
| | 6 | 1.12 | 142 | 121 | 263 | 235 | 1.04 | 125 | 324 | 449 | 431 | .97 | 114 | 592 | 706 | 736 |
| 100 x 100 | 4 | 1.12 | 139 | 154 | 293 | 262 | 1.07 | 124 | 444 | 568 | 530 | 1.03 | 117 | 807 | 924 | 895 |
| | 5 | 1.45 | 168 | 168 | 336 | 232 | 1.39 | 147 | 480 | 627 | 450 | 1.33 | 138 | 858 | 996 | 750 |
| | 6 | 1.82 | 192 | 181 | 373 | 205 | 1.72 | 181 | 498 | 679 | 394 | 1.63 | 164 | 908 | 1072 | 658 |
| 150 x x150 | 4 | 2.35 | 230 | 304 | 534 | 227 | 2.29 | 208 | 891 | 1099 | 480 | 2.23 | 197 | 1655 | 1852 | 830 |
| | 5 | 3.03 | 280 | 323 | 603 | 199 | 2.93 | 253 | 933 | 1186 | 405 | 2.85 | 234 | 1726 | 1960 | 690 |
| | 6 | 3.74 | 328 | 341 | 669 | 179 | 3.61 | 302 | 960 | 1262 | 350 | 3.48 | 275 | 1806 | 2081 | 600 |
| 200 x 200 | 4 | 4.05 | 334 | 503 | 837 | 207 | 3.97 | 309 | 1467 | 1776 | 445 | 3.90 | 290 | 2802 | 3092 | 795 |
| | 5 | 5.15 | 402 | 527 | 929 | 180 | 5.05 | 366 | 1542 | 1908 | 380 | 4.95 | 338 | 2895 | 3233 | 655 |
| | 6 | 6.38 | 477 | 552 | 1029 | 161 | 6.20 | 430 | 1596 | 2026 | 325 | 6.02 | 399 | 2983 | 3382 | 560 |

Concrete linings may vary from a thin plaster coat to one having a thickness of 4 inches and laid or reinforced so as to reduce cracking due to temperature changes. Any concrete lining sufficiently strong to maintain itself without excessive cracking will satisfy the requirements of seepage prevention. The thickness of such linings is determined by the prevention of excess cracking or injury to the lining.

Concrete lining should be laid only on well settled banks. Where reservoirs are constructed by excavation within the banks, the bottom and lower portion of the banks will be in-cut and not subject to uneven settlement. Linings should not be placed on banks built by usual methods until they have been subject to rains and settlement. The bottom and sides should be carefully trimmed and rolled before lining.

The placing of concrete linings may be done by the owners of the reservoirs, but better results are usually secured by employing those experienced in such work, either by the day or on a contract basis.

For thin linings, resembling plaster linings as they are called, a mixture of 1 part cement to 3 or 4 parts of sand is usual. This would be used for thickness up to one or 1½ inches. For greater thicknesses gravel can be added, giving a concrete of 1 part cement to 2 parts sand and 4 parts gravel, for work where rich mixtures are desired. One part cement to 3 sand to 5 gravel may also be used. A thin mortar coat may be applied to the surface to increase the imperviousness. The maximum suze of the gravel should not exceed about one-half the thickness of the lining.

The following table of average costs of concrete linings for canals is given in Irrigation Practice & Engineering, Vol. 11, by B. A. Etcheverry. These costs are typical of the larger amounts of work on canal lining, for the smaller reservoir jobs the costs will usually be somewhat higher, as the work cannot be as effectively organized.

**Average Costs of Concrete Linings**

| Thickness of lining | Normal total costs of concrete linings in cents per square foot | |
|---|---|---|
| | From | To |
| 1 | 2.75 | 3.50 |
| 1½ | 3.50 | 4.50 |
| 2 | 4.25 | 5.50 |
| 2½ | 5.10 | 6.50 |
| 3 | 6.00 | 7.50 |
| 4 | 7.50 | 9.50 |

The above discussion of the various methods of reducing seepage indicates that a clay or oil lining may be placed at costs of 1 cent per square foot, plaster linings for about 3 cents, and heavier concrete linings for about 6 cents per square foot. In a previous article the relative costs of earth reservoirs of different sizes and depths has been given. The effect of the cost of such linings on the total cost of reservoirs in terms of the capacity secured can be seen, if to the cost of the untreated reservoirs is added the cost of the lining for the prices given above. This is done for typical sizes in table 1. The lining is carried 6 inches above high water level and the banks six inches above the lining. The dimensions of the banks are the same as those given in the previous article, except that when lined with concrete the inner slope may be made steeper. For the clay puddle and oil linings or those estimated to cost 1 cent per square foot an inner slope of 2½ to 1 is used; for plaster linings this may be made 2 to 1; for heavier concrete linings 1½ to 1 can be used. The reservoirs are figured for balanced cut and fill, the material for the banks being excavated from the inside of the reservoir.

In Fig. 1 the cost per acre foot of capacity for different capacities is shown. The curves are for various depths and costs of lining. For the unit prices of construction used, these curves indicate that for lined reservoirs the greater depths are more economical. Where linings costing 1 cent per square foot are to be used the depths of 6 feet are cheaper. The difference between depths of 4 or 6 feet for any given capacity is not large, however. For clay or oil linings depths of 6 ft. would not be exceeded unless a material saving in cost would be made due to the greater danger of breaks with higher banks. If land is valued at more than $100 per acre, the greater depths would be relatively cheaper, and a depth of 6 feet would be economical. For land valued at less than $100 per acre, 4 or 5 foot depths, particularly for the smaller sizes, would be preferable.

Where linings costing 3 cents per square foot are used, the cost of the lining becomes relatively more important than the cost of the bank, and the greater depths are less expensive per unit of capacity. There is little saving for depths of over 7 feet, and for the

capacities shown a depth of 7 feet may be taken as the maximum desirable. The linings represented by a cost of 3 cents per square foot are plaster coatings of cement which do not have sufficient strength to enable light banks to be used, so that depths greater than 7 feet add to the danger of breaks. Depth of less than 4 feet are more expensive per unit of capacity even when no value is given to the land used.

For linings costing 6 cents per square foot the cost of the lining controls the total cost. The cost per unit of capacity decreases with increase in the depth to greater depths than with the cheaper linings. Where depths greater than 8 feet are used, the pressure on the outlet gates increases the difficulty of operation, and geared gates will be required for the larger sizes. Unless a material saving can be made in construction costs, depths of over 7 feet would not be desirable. Such linings are sufficienty strong to reduce the risk of breaking of the banks so that greater depths may be safely used than with the lighter linings.

The figures given are for reservoirs using excavation from the inside to make the fills. If ground at sufficiently high elevation cannot be secured to make this method practicable, the banks will have to be biult entirely above the ground surface. This does not materially increase the cost for the reservoirs using the more expensive linings as the total cost consists mainly of that for the lining.

A comparison of the estimated cost of reservoirs of economic depth for different capacities for the different types is given in the following table:

**Comparative Estimate Costs of Reservoirs**

| Capacity acre feet | Unlined earth | Cost per Acre Foot of Capacity Lined at cost of 1c per sq. ft. | Lining cost. 3c per sq. ft. | Lining cost. 6c per sq. ft. |
|---|---|---|---|---|
| .5 | $160 | $300 | $480 | $750 |
| 1.0 | 130 | 250 | 420 | 670 |
| 2.0 | 110 | 210 | 360 | 590 |
| 4.0 | 80 | 180 | 310 | 540 |

This table shows the much lower costs which can be secured where lining is not required and indicates the reason why reservoirs are not generally used in localities where the soil is such as to require lining unless the cheaper forms of lining can be used or the value of water warrants the high cost of the better linings.

In addition to the questions of first cost the relative permanence of each type of lining must be considered. Oil linings in canals have not been as permanent as expected. They have not been in use in reservoirs sufficiently long to give data on their life in such linings. Clay puddle should have a relatively long useful life. Thin plaster linings will not be as permanent as those of greater thickness or those in which wire mesh or other reinforcing is used. Plaster linings on well settled banks free from frost action would be expected to last 10 years, heavier or reinforced linings 20 years. In some cases these figures may be exceeded, in others where linings are poorly built they may not be realized. The longer useful life of the more expensive linings make them relatively cheaper in cost of actual service than the figures of first cost would indicate. By balancing the value of water loss saved by a lining against the annual charge for interest and depreciation of the lining the relative economy of each type may be compared for any individual case. With water pumped through high lifts where reservoirs are used 60 days per year, a reduction in seepage losses of 1 to 2 inches in depth per day may have a value in excess of the cost of lining.

The figures of cost given are for normal conditions of materials and labor and are based on results secured in the past. Under present war conditions it would be difficult to construct such reservoirs at the figures given if outside labor had to be employed.

## NEW RADIO PLANT IN HAWAII MOST POWERFUL IN THE WORLD

The opening of the Navy's new high power radio station in the Hawaiian Islands is announced. This station is the most powerful radio station in the world and is designed for direct communication with Washington and the Philippines. Exchange of messages was carried out recently between the radio station, Sayville, Long Island, and the Honolulu station, a distance of approximately 5,000 miles. This is the world's record for long distance exchange of communication by radio, and marks a distinct advance in the radio art. The tests to date indicate that communication between Washington and the Philippines will easily be accomplished with but one relay through the Hawaiian station.

The Hawaiian station is one of a chain of high-power radio stations under construction by the Navy Department. The principal stations completed to date, in this chain, are Arlington, Darien (Canal Zone), and San Diego. The remainder of the stations, at Cavite (Philippines) Guam, and Tutuila will be completed during the next two months. The high-power stations consist of three masts at each station to support the aerial, each mast being steel self-supporting. The apparatus is of the Poulsen arc type, which is standard in stations of the high power chain. Suitable and comfortable quarters are provided personnel at each station.

## BEFORE ELECTRICITY

As a contrast to the news of the latest advance in the electrification of railroads, it is interesting to read a "Copy of the Rules for Travelers on the First Railway," a document still preserved among the archives of the company of the Manchester to Liverpool Railway.

1. Any person desiring to travel from Liverpool to Manchester, or vice versa, or any portion of the journey thereof, must, 24 hours beforehand, make application to the station agent at the place of departure, giving his name, address, place of birth, age, occupation and reason for desiring to travel.

2. The station agent upon assuring himself that the applicant desires to travel for a just and lawful cause, shall thereupon issue a ticket to the applicant, who shall travel by the train named thereon.

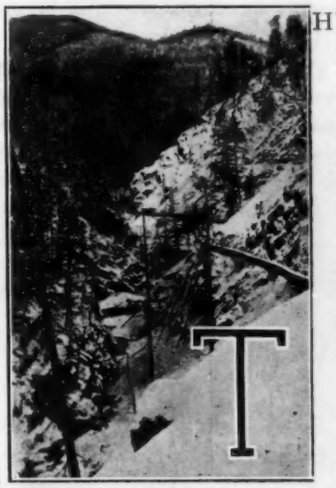
3. Trains will start at their point of departure as near schedule time as possible, but the company does not guarantee when they will reach their destination.

4. Trains not reaching their destination before dark will put up at one of the several stopping places along the route for the night, and passengers must pay and provide for their own lodging during the night.

5. Luggage will be carried on the roof of the carriages. If such luggage gets wet, the company will not be responsible for loss attaching thereto.

# ELECTRICITY IN A MONTANA MINE

*(Mountain snows in the winter and the great dust involved in the crushing processes in the summer offer the greatest problems in a mountain mine such as that of the Snowstorm Consolidated. Here is a mine which in spite of such difficulties is successfully operated by electricity throughout.—The Editor.)*



Heavy snows in winter necessitate the protection of the flumes and railroad bed.

THE mill crusher, roughing tables, elevator, mills and hoist of the Snowstorm Consolidated Mines are now completely handled by electricity, and the company is further considering the adoption of electric storage battery locomotives and the installation of the electrolytic process for extracting the zinc from the ore.

The hydroelectric plant is located on Lake Creek above the falls, about 2 miles from Troy, Montana. From the dam the water is conveyed by 2000 feet of flume to a 2100 h.p. Pelton-Francis Turbine connected with a 1250 kva., 6600-volt 3-phase General Electric generator which supplies the power for the mine. The mill substation, a mile and a quarter from the power plant, provides the necessary switches and transformers. The voltage is here lowered to 2300 for local distribution, all motors with but one exception being operated from the 2300-volt service.

An interesting problem is met with in the operation of the mill. Owing to the excessive amount of dust inherent in the processes of crushing and handling the ore, it has been found that induction motors of the squirrel cage type started by means of a compensator give less trouble to maintain. This type of motor, however, involves some difficulty in starting and it is necessary to make several attempts each time before the mill gets under way. By throwing the compensator handle to the starting position and releasing it quickly, the mill swings, however, and by catching it on the swing, the motor is enabled to bring the mill up to speed. As the mills run for weeks without stopping, no great inconvenience is experienced by this method of starting.

The mine itself is some 5 miles distant from the mill, being connected by the transmission line, a narrow gauge railway which winds about the mountain slopes far above Calahan Creek and the wooden flume which diverts the water from this creek three miles above the mill. Owing to the extremely mountainous character of the country, great difficulties in construction were met with at certain points. In the original building of the roadbed it was occasionally found necessary to let the first crew down from overhead by means of a rope and thus enable them to blast a way past the walls of the canyon. Winter snows and the consequent snow slides, rock slides, and falling trees constitute a further problem which must be met both in the case of the flume and the railway.

Practically every process in the handling of the ore is now electrically operated—and with the adoption of the electrolytic process of extracting the zinc, the round will be practically complete.

THE CONCENTRATOR PLANT

THE LAKE CREEK FLUME

From the dam above the falls, the water is conveyed by flume to a 60 inch penstock, thence to the turbine and generator. The mill substation is about a mile and a quarter from the power plant.

# SHORT JOURNEYS IN PACIFIC LANDS

*(The question of where to stop in the orient is one which always concerns the prospective traveler, but it proves to be a problem easily solved. South America still presents greater difficulties in accommodations and traveling facilities, but the engineering traveler usually finds a way out.—The Editor.)*

## THE HOTELS OF JAPAN

### The Oriental Hotel at Kobe

Electrical methods have not yet been adopted by all of the industries of Japan

THE Oriental Hotel at Kobe, Japan, like the Grand Hotel at Yokohama, is located along the "bund" or water front. Kobe is the greatest shipping port of Japan and exceeds even Yokohama, although to many the latter city, due to its close connection with Tokyo, is of far more interest. The harbor of Kobe is not by any means so picturesque as that of Yokohama. On the other hand, the near situation of the hills immediately in its rear give Kobe a distinct charm not possessed by the latter city. The appointments of this hotel are strictly first class and quite similar to those of the Grand at Yokohama.

### At Nagasaki the Belle-Vue is Interesting and Unique

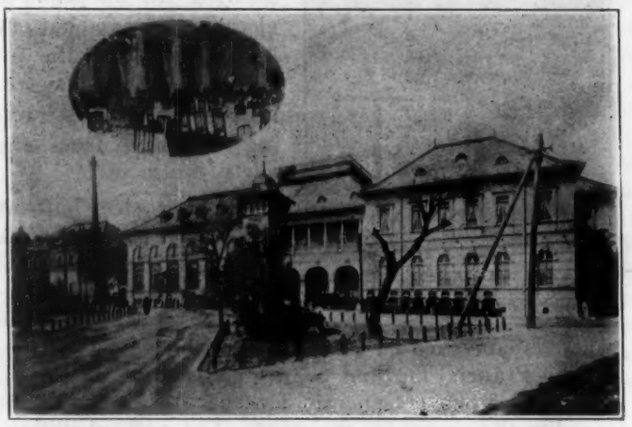
At Nagasaki, the great coaling port of Japan, the principle hotel is the Belle-Vue. Its surroundings are quite different from the two former hostelries just described. It approaches the Japanese in arrangement and departs materially from the European or American methods. Situated among beautiful foliage with a view of the nearby water front, the hotel has a distinct charm that one would enjoy if forced to stay in the interesting but secluded port of Nagasaki.

Returning again through Japan, one may go overland to Tokyo, in which case information relative to the leading hostelry of the Imperial city as well as those of Osaka and Kyoto will be useful.

### The Osaka Hotel, the Metropolis of Japan's Industrial Life

Osaka is the great manufacturing center of Japan, and is located about a half hour's journey by rail from Kobe. As one approaches the outskirts of this great metropolis, the second largest in Japan, the smoke from a hundred huge chimneys rising in the distance brings to the imagination the great manufacturing and industrial cities of America—Pittsburg, and the like.

Met at the depot by enterprising, alert red cap boys, one is forcefully reminded that the red cap negro porter of America would certainly have to awaken before he could be placed in the same class with these men. But a few minutes elapse before one arrives by rickshaw at the Osaka Hotel. The structure is a substantial, businesslike edifice, with little to attract the interest of the foreigner, except that here is to be found the best cuisine of any hotel in Japan. The edibles are all planned and prepared under the direction of a French chef. Though all courses travel under French names they are all free from the spice and heavy seasoning so often encountered in one's travels. There is little to interest the tourist, but much for one interested in the industrial development of a great nation. No dansants



THE OSAKA HOTEL

This well-built hostelry of Osaka, Japan, is in full keeping in design and construction with the industrial life and enterprise of this, Japan's greatest industrial center. There are few things in its appointments to interest the tourist but the man on business bent finds everything needful for his comfort and convenience.

were under way during our stay, but instead banquets of business men eager to extend trade and heighten business relations were constantly being held at the hotel. Thus is reflected as a rule upon the principal hostelry the life and ambitions of the metropolis itself.

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## DOING BUSINESS IN GUATEMALA

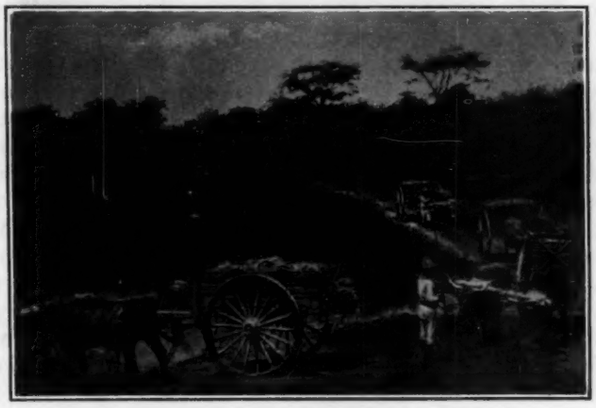
BY J. W. FINCH

The trip through the mountains and down the western slope to Escuintla at the base, is one which affords some truly beautiful scenery and at points along the line there are magnificent vistas of the gently sloping, nearly flat lowlands, with the majestic Pacific Ocean in the far distance. These lowlands of the west are developed to a greater extent than the eastern part of the Republic. The largest and most productive coffee "fincas" being here, as well as lands upon which are cultivated wheat, barley, corn, beans, sugar, rubber, cocoa, fruits and fibers. Mahogany grows abundantly and is so plentiful that it is used for railroad ties. Cattle is also raised on a quite extensive scale.

Escuintla is the first town of importance on our trip and lies at a considerable lower altitude than the capital. The Gran Hotel Ferrocarril here is, in common with nearly all other native hotels I have encountered, an almost impossible place to stop. After getting into the lightest of Palm Beach clothes, for here the heat is intense, we are ready to look around the town and we find it is small and can be worked

in a day if no time is lost. There are three or four merchants here who import directly from the United States, although not in large quantities. Here are also located store rooms of the railroad company. We are glad to leave Escuintla for Mazatenango, the next town, as we feel sure the accommodations cannot be worse. There are other small villages on the way but none of them supporting anything excepting small native stores.

Leaving Escuintla, the right of way passes through truly tropical country, the track being lined



**ELECTRICITY NEEDED**

**Transportation facilities in Guatemala might easily be improved by the introduction of electric railways. These bullock carts are seen commonly in the city as well as in the country.**

on both sides with trees and plants of many varieties. Every way we look and as far as we can see, are green things growing; bananas, cocoanuts and pineapples line the right of way. Immense bread fruit trees, mangoes, mamays and aguacates are seen in abundant profusion. It is afternoon and raining, as it does every afternoon at this season (June). Seldom, if ever, will it rain in the morning, but it is not safe to go a great distance from cover in the afternoon without a rubber poncho, or other adequate waterproof protection. A rain storm comes upon you without warning and unless you have experienced one you can have no conception of the amount of water that can fall from the heavens in the space of a minute. Well, the average rainfall per season from May to October, in the "Occidente" is 200 inches more or less. If you happened to be caught in the open some afternoon you would think this amount was a week's average instead of a season's.

The road to Quezaltenango is well defined, but nevertheless we have a mozo who accompanies us on foot to direct the way. He easily keeps up with the mules who have a sort of pacing gait and are really not uncomfortable until you have been in the saddle for a few hours. We make the start at six o'clock in the morning and immediately commence climbing, as Quezaltenango is 7335 ft. in elevation and we cross the summit of the mountains at about 9000 ft. We encounter on the road during the day probably not less than five or six hundred mozos with their women and children, all of them carrying something, even to the child of six or seven. All freight, excepting the largest and heaviest pieces is carried into Quezaltenango on the backs of these native Indians. We encountered a group of probably thirty mozos with Singer sewing machines on their backs, another group with cases of petroleum, another with flour, still others carrying bananas, melons and vegetables, these latter coming from the fincas or some small farmer's little patch of land, to the market. The road in places is almost impassable and we wonder how an automobile can negotiate it. After six weary hours in the saddle, continually climbing, climbing, climbing, we reach the little Indian village of Zunil at the base of the Santa Maria volcano, which a few years ago erupted violently, covering the surrounding country with ashes and causing considerable property damage. We have crossed the volcano well up on its side and one section of the road passes close to steaming fissures in the mountain side, while a boiling geyser is seen a little way below us, shooting a stream of water high into the air. The entire mountain slope is enveloped in a bank of steam and it makes us wonder and marvel at the works of nature.

Before leaving San Felipe we have changed again to our heavier clothing but as we pass through another and smaller Indian village, Almolongo, and approach Quezaltenango, which is just across the hill, we almost wish we had overcoats. The air is fresh and crisp until we get into the city. The air is still crisp but if you have ever been in a Latin American town you will know that it is far from fresh. You soon become accustomed to these things in the tropics. Quezaltenango is an old city and is the capital of the department of the same name. It has its plaza, without which no Latin American city or town is complete, a municipal palace, an armory, a municipal theater, a bank and a half dozen more or less import houses. It is the distributing point for a large but not very thickly populated section.

**The Guatemalan streets have at least the telegraph poles in common with home**

After a stay of a few days here we return to San Felipe, making the journey this time in the diligencia. The automobile had made the trip the day before, but we were not finished with our business so the next day we had to choose one of two evils. We chose the diligencia but never again. At least if you ride a mule you can miss some of the boulders and holes and you don't have to hold on for your life for a solid eight hour stretch. Besides you have a seat wider than six inches. My advice is to choose the mule every time.

When we return to San Felipe we find our trunk, which has been despatched by a guaranteed-to-be-trustworthy mozo, awaiting us. The trunk is on time but minus its straps and ropes. We don't mind this as we are used to such things here and consider it all a part of the day's work.

# CURRENT RATE FIXING PROBLEMS

BY C. E. GRUNSKY

*(One of the most difficult problems in the fixing of rates lies in the establishing of values for reservoir properties held. Do such lands hold a value peculiar to themselves or are they to be judged upon the same basis as other real estate? Questions of the elements involved in such valuation are here considered by an eminent writer and authority on this subject.—The Editor.)*

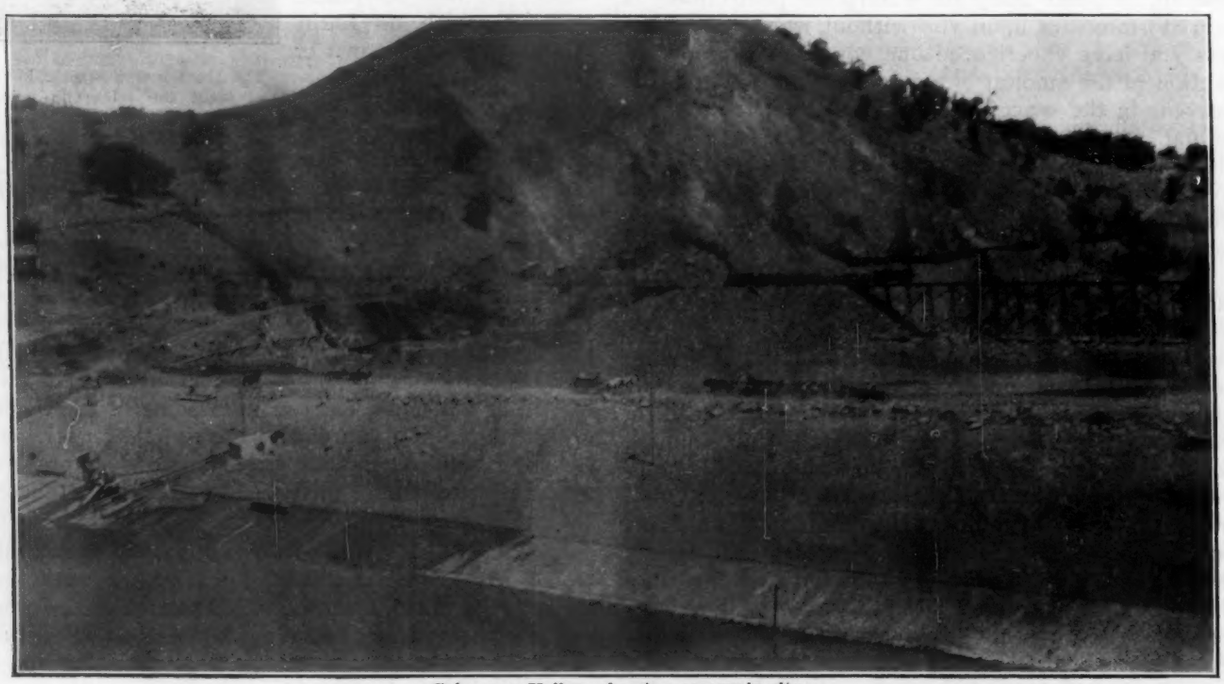
## THE VALUATION OF RESERVOIR LANDS IN THE SAN FRANCISCO BAY REGION

No definite solution of the problem how to determine the value of reservoir property has yet been devised. There is, in fact, no recognized rule by which the market value of any property which has peculiar adaptability for some particular use can be determined. No other course is open in ascertaining the value of such property than to determine the effect upon the market of a knowledge of all the circumstances bearing upon each case.

Speaking generally of the value of real estate, it may be said that the effect of all factors which influence its market value is reflected in the valuations made from time to time by experts, and by the courts or other public authority, and also by the sales of which knowledge is obtainable. The essential element of rental value or productiveness will be presently referred to. As the previous valuations and records of sales of similar property do not apply to the time at which the valuation is being made, some attention must be given to the rate at which the value of real estate, expressed in terms of money, has been advancing. For the region on both sides of the south arm of San Francisco Bay such a study has been made and the results thereof are hereinafter presented. This study has been extended to five of the bay counties and to the entire State of California and covers not alone the rates at which real estate values have been increasing but also the rate of population growth.

As population increases the uses to which land can be put with profit are advanced from lower to higher uses. The value of land will go up as the demand for its higher use becomes more insistent. If any tract of land taken at random be considered, its value will go up in some relation to the increasing density of population in its vicinity. The more remote that it is from a population center and the smaller the demand of society that it be put to beneficial use, the more difficult will it usually be to trace the effect of the growth of population on its value. For a time the supply of land on the frontier is so large that the value thereof may not be determinable from the return that can be realized by using it in any particular way. But even in the case of the frontier land it will be found that as the demand of society for the beneficial use thereof increases its value will increase. When the time can be forecast with some degree of certainty, at which the land will be in demand for any particular use, the basis for estimating value begins to assume definiteness. When finally, under use for certain purposes, the land can be depended upon to produce income, the basis of its value, in part at least, becomes positive. It may, nevertheless, still continue to have more or less speculative value due to its proximate requirement for higher uses.

Ordinarily when the value of land is in question, the return which the land produces in rents or otherwise, or the return which it may reasonably be hoped to realize in the future, as also the sales of other sim-



Calaveras Valley, showing reservoir site

ilarly located property adapted to similar uses can be used as guides to a determination of market value. The actual sales are valuable, if there have been any, because they furnish more or less dependable evidence of the effect of all known circumstances upon the public mind in the matter of land value. But when land is under consideration which is in use or which is available for use as a storage reservoir there is usually no such index of market value which can be applied. It would be an unusual circumstance to

San Leandro Dam

find sales of recent date of similar property that would with any definiteness demonstrate the market value. Neither is the rental value of such property for the reservoir use to which it is specially suited, ascertainable, even when already in use, because actual competitive demand for such property is usually out of the question and it is not practicable to so apportion the net return of the water supply business that the amount thereof which should be ascribed to the use of the reservoir lands and which might be a key to rental value can be ascertained.

There are, nevertheless, many circumstances which, when properly understood, will have an effect upon the market value of reservoir properties. Such, for example, are the time when the use of the reservoir site in question will be a necessity, and the time when the water supply commanded and made available by the reservoir will be in full use; also the existence and relative availability of other storage sites or other sources of water; the location of the reservoir site and all circumstances affecting the cost of developing the storage and of developing the water, particularly when the reservoir site is not yet in use nor immediately requisite; also the extent to which the availability of any particular site has been demonstrated by the actual construction of works and the impounding of water; the quality of the water, and every circumstance relating to valuations theretofore made by competent authority of the property in question or of other like properties, whether for rate-fixing or other purposes.

Consideration should therefore be given:

To the adaptability of the site for use as a reservoir.

To the necessity for such use immediately or in the near future and to the continuance of such use.

To the fact that the reservoir lands have been assembled in one holding.

To the question of whether or not the serviceability of the reservoir site for water storage has been demonstrated by actual use.

To the cost of the lands and their increase in value since the time of purchase.

To the valuations of these and other reservoir lands heretofore determined or ascertained by rate fixing authorities and by the courts.

To the service rendered or to be rendered in the matter of the amount and quality of the water and the advantages or disadvantages of the location of the reservoir site, particularly when one of the functions of the reservoir is to safeguard a supply.

None of these factors taken separately leads to a determination of value which could be accepted without question. Any or all of them may influence a willing seller or a prudent purchaser in determining the sale or purchase price of such properties and they all, therefore, must be regarded as having more or less effect upon market value.

Any evidence furnished by sales of similar property should be carefully examined and should not be too heavily weighted. In the case of any individual sale there may have been lack of information on the part of the seller of the full market value of the land or the sale may have been prompted by other considerations than the price obtained for it. Consequently but little dependence can ordinarily be placed on any single real estate transaction.

It is the multiplication of these transactions which makes them, presumptively at least, an index of the judgment of the public relating to market value. The fewer the number of transactions and the greater the uncertainty relating to the circumstances in each thereof, the less dependable will any such index necessarily be.

The elements which determine the utility of a reservoir area for the development of a water supply by storage are in the main:

1. A fairly level area of considerable extent enclosed or nearly enclosed by higher land, forming a basin which may have an outlet and possibly in addition one or more low places or secondary outlets in the surrounding rim land, all of which can be closed by dams.

2. A tributary watershed from which the run-off due to snow and rainfall is sufficient to be worth while, after allowing for evaporation and other water losses from the reservoir.

San Pablo Dam

3. A geologic formation such that the construction of the necessary dam or dams is feasible and water losses from the reservoir will not be excessive.

4. A location and topographic configuration such that the cost of structures will not be prohibitive.

5. A market, present, or prospective, for the water supply which will be made available.

In the case of a storage reservoir the prime purpose of which is to hold a supply of water in reserve, for emergency use, and whose serviceability as a producer of water is secondary, an element of first importance in determining its utility will be location in reference to the district to be served and in relation to the other works for the supply of the district.

The function of the storage reservoir, broadly stated, is to bring the natural flow of the stream which feeds it under control, so as to make better utilization possible and to reduce waste. Without a storage reservoir the limit of utilization at any particular time is the discharge of the stream at that time. In the vicinity of San Francisco stream flow fluctuates within wide limits. Under the peculiar climatic conditions of the Pacific Coast the stream which flashes up to a large discharge and flood stages, under the influence of the winter rain storms, may dwindle to insignificance in the long dry period of summer or in the interval between the intermittent rains of the winter months. As a source of water for use in supplying the needs of the inhabitants of a city, such streams as those controlled by reservoirs in the San Francisco bay region would be of but little value without storage reservoirs. Nevertheless, in any strict analysis of the service rendered by a reservoir in increasing the water supply from the stream which feeds it, some account should be taken of the additional amount of water (that is of the water in excess of that obtainable from the stream in its natural condition) which the reservoir makes available. Under California conditions, in the Coast Range and in the lower portions of the Sierra Nevada this is frequently the entire possible water output, because without storage the obtainable dependable continuous supply measured by the minimum natural flow would not justify utilization.

It is, of course, different when water is required intermittently and in coincidence, or nearly so, with the natural large flow in the stream as may be the case when water is used for irrigation. Thus, for example, a large part of the snow which falls during the winter months in the high Sierra Nevada Mountains, melts and appears in the stream in the spring and early summer months at the very time when water is in demand for irrigation. When, on a stream which carries this water, storage is provided, there will be better control of the flow, wastage will be reduced, and water may be held over from a season of abundant run-off to another in which the natural flow is light, but the condition will rarely prevail under which the storage reservoir could be given credit for the entire amount of irrigation water developed and withdrawn from the stream.

The utility of the reservoir in such a case is measured by the improved service which it makes possible and by the reduction in the amount of water that without the reservoir would go to waste.

In view of the conditions as they prevail in the San Francisco Bay region the comparison of storage reservoirs here, whose water is used to supply the needs of the residents of cities, can best be made on the basis of the water output or yield per acre of ground covered by the reservoir. But in addition, other factors, such as the amount of storage per acre of reservoir, and the location of the reservoir may also require attention and, of course, too, the suitability of the water for the uses to which it is to be applied.

Attention may be called in this connection to the fact that there may be reservoirs of so large an extent that their value per acre of reservoir surface is small. The case of a lake may readily be conceived which has a large surface area and which with a low, perhaps inexpensive dam, will store a large amount of water. From such a reservoir the loss of water by evaporation will be relatively large and it may well be that the water production will now and then be negative, that is, there will be occasional years with less inflow into the lake than is required to make good the evaporation. As an extreme example of this kind, Goose Lake, in the northeasterly corner of California may be cited. For more than a half century there has been no outflow from this lake. As a storage basin in the ordinary sense this lake would have no value. Tulare Lake is another example. Occasionally in such seasons as 1861-62 and 1867-68 the lake has been full and during a series of years when at or near a full stage, has contributed to the flow of San Joaquin River. But some forty years have now elapsed since there has been any outflow from the lake. The evaporation from the large area that is exposed to evaporation when there is water in the lake offsets the inflow in ordinary years.

To make the lake a dependable source of water provision must be made to draw down its water to lower levels, thereby reducing the water surface area and decreasing the annual evaporation.

Other examples can be cited of lakes which are of so large an extent that their value as storage basins is low when compared with other reservoirs of the same storage capacity but of less surface extent.

There may be instances, too, though in the case of storage reservoirs they appear as exceptions rather than as the rule, where the superior function of the reservoir is to hold water in reserve to be available in case of accident to the system as ordinarily in use. Under such circumstances the value of the reservoir n ay not depend upon its water production but rather upon its location and storage capacity. A case in point is Merced Lake, located within the limits of San Francisco, which rendered such valuable aid as an ample emergency source of water in 1906, during the time that, as the result of the earthquake and fire, the main lines of San Francisco's water supply were temporarily out of commission. Water from this lake is in use in small quantity, about 3,000,000 gallons per day. It is expected that this use will cease in the near future when an additional supply of water is brought across the Bay from the Alameda and Calaveras Creek systems. As an emergency source of water the lake will thereafter continue to have value, but this value can not be brought into any satisfactory relation with the value of other more remote storage sites on the basis of water production or utilization which for Lake Merced may soon be so small as to be negligible.

Such factors as these are among those to be considered when the water production from reservoirs or the value of reservoir land is to be determined.

# WOMEN IN THE INDUSTRY

*(The European countries are coming to the point where they are providing definite special technical training for the women who have entered the industrial field. The Y. W. C. A. is the only organization in America which has taken public measures to meet the war situation in this respect. Not only have they cared for special war conditions near camps and munition plants, but they are helping to train workers where needed and to maintain the spirit of those now employed. Their special national drive for four million dollars which starts on December 3rd deserves your support.—The Editor.)*

## THE Y. W. C. A. IN YOUR INDUSTRY

Besides the extensive special war work which the Y. W. C. A. is carrying on in the regions adjacent to National Army Camps, they have realized that part of the need of the national crisis consists in the avoidance of just such problems as strikes and dissatisfaction among women workers in the trades and industries. With the idea of making every girl in the United States feel that her service in industry or in the home was a patriotic one, they have fostered the work of the Patriotic League under the direct supervision of the Junior War Work Council.

All girls are eligible irrespective of race, religion or occupation. Any body of employees or group of girls may adopt the work of the League without in any way giving up their entity or special work. An idea of the nature of the league is to be gained from its pledge:

### Pledge of the Patriotic League

PATRIOTIC LEAGUE

I pledge to express my patriotism
By doing better than ever before whatever work I have to do;
By rendering whatever special service I can to my community and country;
By living up to the highest standards of character and honor and helping others to do the same.

Signed, _____

In the work that they are now doing, the girls are urged to stick to the job that they are trained to do; to get the most out of every hour. They are urged to handle tools carefully and care for them in such a way that they may give their best service, to make their work just as perfect as they can make it.

## INDUSTRIAL WOMEN IN FRANCE

One of the great sociological problems with which France will have to deal after the war will be the industrial status of women. Since the beginning of the war female labor has largely supplied the shortage caused by the mobilization of the men. Many of them have taken complete charge of important business interests; they are employed in banks and in technical institutions; factories and plants requiring great numbers of unskilled workers have found an ample supply among the women; they act as letter carriers, telegraph messengers, and street car, truck, and carriage drivers. The general consensus of opinion is that they have "made good," and that they have established for themselves a permanent place in the industrial and commercial life of France.

### Training School for Women Workers

It remained for the mayor of Lyon, Mr. Edouard Herriot, to take the first effective step in providing a professional training school for the higher technical development of women. This school will open its first session on October 1, 1917, and its curriculum will include a commercial course and a technical course of two years each.

The full program of studies for the commercial course includes commercial, industrial, and labor legislation; industrial property; patents; foreign commercial questions, including transportation, storage, exchange, banking operations, etc.; commercial and industrial mathematics, including discounts, values, bills of lading, coinage, and annuities; knowledge of manufactured products of France; political economy; stenography and typewriting; and foreign languages. The course of training for draftswomen and technical secretaries includes industrial design, mathematics, and its higher branches, theory and application of mechanics, technical and machine shop work, theory and application of electricity, and foreign languages.

## ELECTRICAL TERMS ILLUSTRATED—II.

**If you do employ a woman —**

COMPENSATOR

**DID IT EVER OCCUR TO YOU THAT:**

**THE field of window decorating is one that may well be handled by women. The artistic appeal, the advertising and business getting, even such ingenious electric wiring as may be needed are all within her grasp — indeed, women are making a success of this very field. Perhaps the most successful decorator of department store windows in the United States is a woman. One woman is 'consulting decorator' for a series of small stores. If your business is not large enough to need a decorator for your store alone—why not combine, a group of you in different parts of town, and hire one between you?**

# FUEL OIL AND STEAM ENGINEERING

BY ROBERT SIBLEY AND CHAS. H. DELANY

*(Moisture in oil directly affects the commercial value of this product to such an extent that its accurate determination is a matter of great economic value. Here is a resume of all the more important methods employed in commercial practice to ascertain this factor. The discussion concludes with a detailed description of the distillation method for determination of the moisture content in which a numerical example is carried through to a conclusion.—The Editor.)*

## MOISTURE CONTENT OF OILS

From our previous discussion of steam generation in the modern central station it was found that something over a thousand heat units are necessary to convert water at ordinary temperatures into saturated steam. When moisture appears in the oil used for heat generating purposes in the furnace it is evident, then, that large heat losses may thereby be involved. For, not only must this moisture be converted into saturated steam, but this steam itself must be superheated to the temperature of the outgoing chimney gases, thus dissipating energies that should go toward steam generation in the boiler.

**AN ELECTRICALLY DRIVEN OIL CENTRIFUGE**

In this Centrifuge the four arms—two plain and two graduated—are caused to rotate by electric power and the water thus caused to separate from the oil. The consequent measurement of the moisture present is then easily ascertained.

Hence the water involved in fuel oil composition is a dead loss which should be avoided as far as possible. Settling tanks accomplish much in drawing off the water content, but when the water appears in the oil as an emulsion it is almost impossible to commercially segregate it from the oil. Since, then, all fuel oils contain a certain amount of moisture, the careful determination of its exact proportions often becomes an important problem in efficient steam engineering performance.

**Summary of Methods Employed in Determining the Moisture Content.**—There are ten methods by which the moisture content of oil can be ascertained with approximate accuracy. For detailed information on this subject the reader is referred to Technical Paper No. 25 of the United States Bureau of Mines entitled, "Methods for the Determination of Water in Petroleum and its Products." These methods may be briefly summarized as follows:

The moisture content of heavy oils and greases may be approximately ascertained by the loss of weight due to heating.

The moisture content of oil may be approximately obtained by diluting a sample with a sulphate and then causing separation by action of gravity. A diluent is to be avoided in this process, as inaccuracies are liable to be introduced.

Again by diluting with a solvent and separating the moisture content by means of a centrifuge, the moisture content is determined with a slightly greater degree of accuracy than by either of the above methods.

By treating a sample with calcium carbide, another convenient method is also arrived at, and its accuracy is approximately within 3% of the water percentage if care is observed. The sample, too, may be treated with sodium and a convenient and accurate method results.

A color comparator is sometimes used, but the method is only approximate, as is also the method of treating a sample with normal acids. The electrical treatment, on the other hand, is successful in breaking up an emulsion on a commercial scale, or reducing the water content of an oil to such a condition that it may be successfully treated in some other manner. An emulsion is a physical condition of the oil and water wherein the water is held in such intimate contact with the oil ingredients as not to be readily separated by gravity or other ordinary means.

Again, too, distilling a sample mixed with a non-miscible liquid proves accurate to .033 grams of water per 100 cc. of benzine and oil in the distillate.

The most reliable method, however, is that accomplished by directly distilling off the water. This method is convenient and accurate to about .003 grams of water in the distillate, if the water is cooled to about 35° F.

**The Approximate Method of Treatment.**—The method hinted at above wherein the sample is treated by a foreign agent will now be briefly set forth, since such a preliminary determination often proves sufficiently accurate for the issues involved.

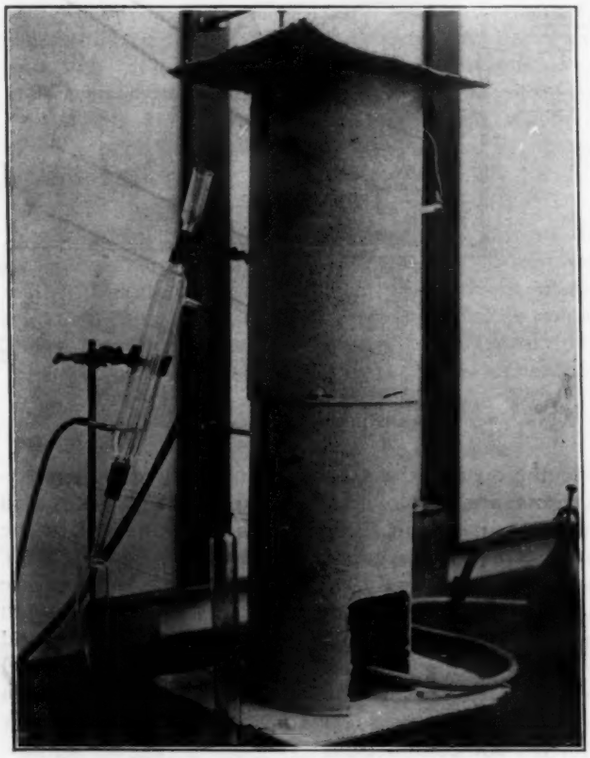
The method here outlined is especially applicable for the lighter oils. A burette graduated into 200 divisions is filled to the 100 mark with gasoline, and the remaining 100 divisions with the oil, which should be slightly warmed before mixing. The two are then shaken together and any shrinkage below the 200 mark filled up with the oil. The mixture should then be allowed to stand in a warm place for 24 hours, during which the water and silt will settle to the bottom. Their percentage by volume can then be

**A GOETZ ATTACHMENT FOR WATER DETERMINATION**

By attaching the pipe shown in the lower part of the figure to a faucet, sufficient power is obtained from the city main to cause the rapid rotation of the two arms shown in the figure. This high rotative speed, due to the centrifugal force developed, causes the separation of the moisture from the oil.

correctly read on the burette divisions, and the percentage by weight calculated from the specific gravities.

**Details Involved in Determination by Distillation.** Since the method of determination by distillation is to be recommended above all others, we shall now proceed to the details of its accomplishment. Stated in simple words, the method consists in heating a sample slightly above the boiling point of water but



**STILL WITH HOOD USED FOR WATER DETERMINATION**

Many methods are utilized in determining the water content of oil. The simplest and most accurate method for fuel oil tests is that of distillation. In this method a sample of the oil is poured into a still and raised sufficiently in temperature to evaporate the water and not the ingredients of the oil. By condensing the moisture and ascertaining its proportions the moisture content is easily ascertained.

not so high as to cause the vaporizing of other ingredients of the oil. As a consequence the water passes over and leaves water-free oil in the sample.

**The Apparatus Involved and Preliminary Proceedings.**—To quantitatively determine the moisture content the sample is placed in a copper vessel known as a still, which is about 4 in. in diameter and 6 in. high. The still is then placed in an asbestos hood through which a projecting stem connects to a condenser and a burette where the condensate is measured in a graduated tube. The can from which the sample is to be drawn is first immersed in a water bath with its cover released. After the water constituting the bath has been raised to a temperature of 150° to 170° F., the cover to the can is fastened tightly, and the can agitated for several minutes in order that any water that may have settled at the bottom may be thoroughly mixed with the oil. For successful agitation the sample can should not be filled more than two-thirds with oil. 100 c. c. of oil sample, measured in a graduated jar, are now poured into the still. The exact measurement of the oil is difficult without experience, as froth collects on the surface of the oil and tends to obscure any definite meniscus.

The jar is next washed with 50 cc. of benzol and 50 cc. of toluene. The washings are poured into the still. Since toluene has a tendency to absorb small quantities of water, accurate results may be interfered with if the toluene is not previously saturated. In order to avoid such a possibility when opening a fresh bottle, 5 to 10 cc. of water should be added. The presence of water in the bottom of the bottle shows that the toluene is saturated, but care must be taken not to pour this water into the still when washing with the toluene.

The still must be gently shaken without splashing in order that its contents may be well mixed, and then placed in the asbestos hood and connected with the condenser. A hood and cover are provided, as shown in the illustration, to surround the still with a blanket of air at a uniform temperature. The still is then heated gradually to a temperature of about 300° F., which is usually accomplished after about fifteen minutes of heating. Since the boiling point of water has been now exceeded, the moisture in the sample begins to pass over into the condenser, and after the lapse of another fifteen minute period the distillation is complete. A thermometer for temperature control is seen at the right side of the asbestos hood in the illustration.

**The Process of Distillation.**—The process of distillation is interesting. At about 176°.7 F. the benzol first passes over. This wets the condenser tube so that the moisture which is soon to follow will not readily cling to the tube but the more easily pass down into the measuring burette. The toluene follows at 230°.5 F., and carries down with it any water which happens to remain in the condenser tube. The toluene does not, however, pass over in its entirety, since usually from 15 to 20 cc. remain in the still with the oil. In order to make up this deficiency in toluene about 15 cc. are poured down the condenser tube to free any small drops of water that may persist in remaining. This, however, does not affect the accuracy of the work, since the water content is finally separated by filtration and the water content thus obtained is alone measured.

The still while at a high temperature is drained, and, as its contents are now entirely free from water, it may be used again without additional cleaning.

Any small drops of water that cling to the side of the graduated measuring tubes must be released by a short wire. If now the resultant water is read in cc. the percentage of water by volume in the oil is easily obtained, since the water is separated from the mixture of benzol and toluene in the filter bottle.

**A Numerical Determination.**—Let us then follow this process by means of an illustrative example. Let us assume that 100 cc. of oil have been drawn as a sample, that 100 cc. of benzol and toluene have been poured with it into the still, and that the resultant distillate shows .484 cc. of water. It then follows directly that the percentage of water by volume is .484.

**Error in Assuming Percentage by Weight is Same as Percentage by Volume.**—The percentage of water by weight is not exactly equal to its percentage by volume, but may be taken equal to it for all practical purposes of boiler testing. This error is then nominal except with very light oils or any oil with considerable moisture content. Thus, if an oil sample of 100 cc, contains .50 cc. of water at 60° F., it will weigh .484 x .099 = .4835 grm.

The percentage of water by weight is, therefore, ..... .4835 / .9673,

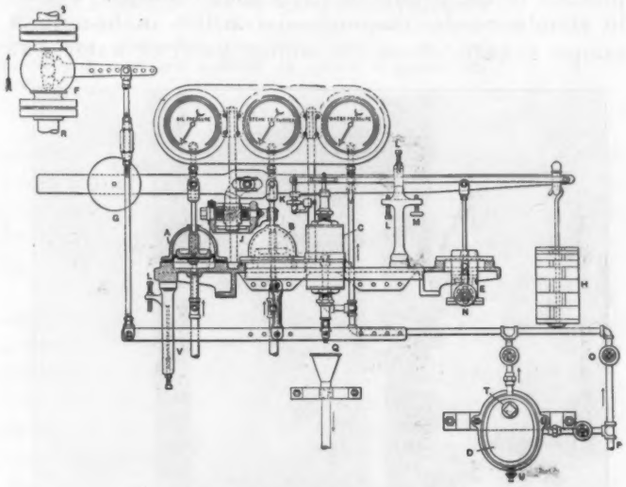
which equals .50%. The factor, .9673, appearing in the above, is the specific gravity of the oil sample at 60° F. This was ascertained by means of a Westphal balance, which is shown in detail in the preceding chapter.

## A NEW SYSTEM OF FUEL OIL REGULATION

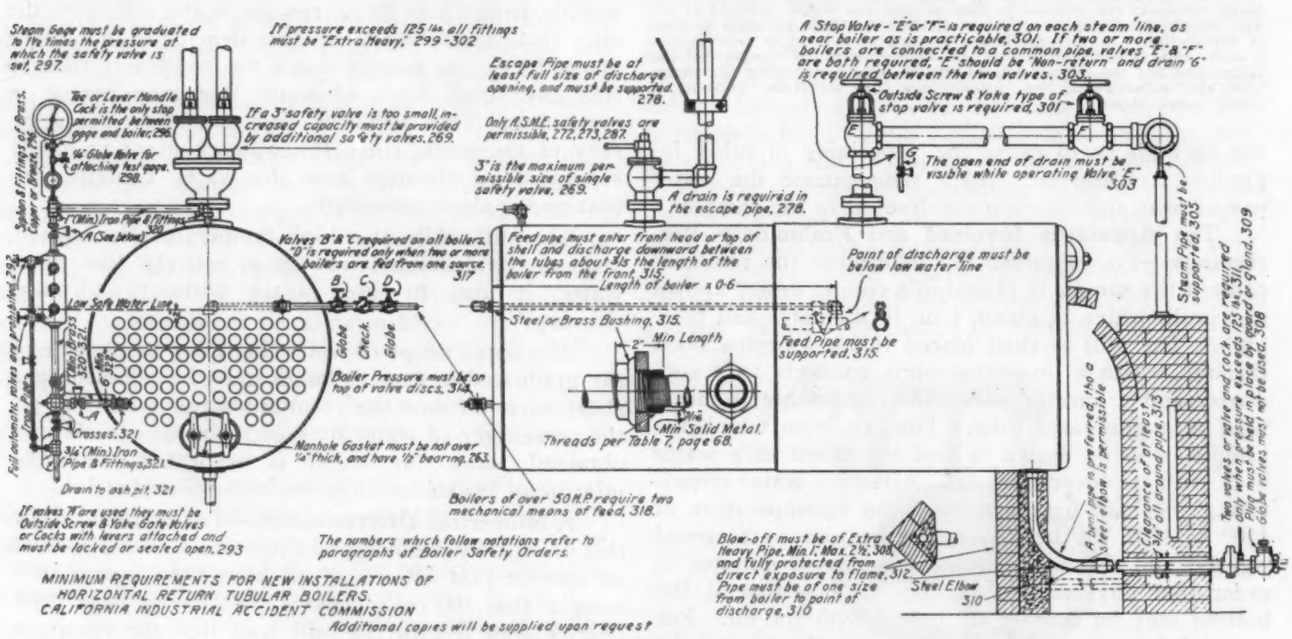
An interesting detail in the boiler plant is the automatic system of firing employed to minimize labor and improve efficiency in burning the oil. The Moore patent fuel oil regulating system which, from one central point, controls the oil supply, the atomizing steam and the amount of air to each furnace, is an interesting example.

This regulator is actuated by the pressure from the main steam header so that any variation in steam requirements will cause a corresponding change in the amount of oil fired, due to an increase or decrease in the steam supply to the oil pumps and atomizers. Any fluctuation in steam pressure operates a governor whose power arm controls a bleeder valve on the oil pump discharge line, thus cutting off the oil supply if the steam pressure is too high and reducing it if too low. Any change in pressure in the oil main, in turn, controls the amount of steam for atomizing and of air for burning the oil.

It is found that a simple straight line relationship exists between the amount of steam required for atomizing the oil and the amount of oil burned. Two diaphragms are employed to balance the pressures in the oil main and in the steam main connected to the burners, these pressures in this instance being 200 lb. and 80 lb. respectively. Any difference in oil pressure operates a rotary chronometer valve in the steam main through the medium of a fulcrum, water motor and lever connecting rod. Likewise the variance in oil pressure actuates a counterweighted rock shaft which moves the dampers so as to vary the amount of air admitted for combustion.



Steam to Burner Regulator


Steam Gage must be graduated to 1½ times the pressure at which the safety valve is set, 297.
If pressure exceeds 125 lbs. all fittings must be "Extra Heavy," 299-302
Escape Pipe must be at least full size of discharge opening, and must be supported. 278.
A Stop Valve - "E" or "F" is required on each steam line, as near boiler as is practicable, 301. If two or more boilers are connected to a common pipe, valves "E" & "F" are both required, "E" should be "Non-return" and drain "G" is required between the two valves. 303.
Outside Screw & Yoke type of stop valve is required, 301
Tee or Lever Handle Cock is the only stop permitted between gage and boiler, 296.
If a 3" safety valve is too small, increased capacity must be provided by additional safety valves, 269.
Only A.S.M.E. safety valves are permissible, 272, 273, 267.
3" is the maximum permissible size of single safety valve, 269.
A drain is required in the escape pipe, 278.
The open end of drain must be visible while operating Valve "E" 303
Valves "B" & "C" required on all boilers. "D" is required only when two or more boilers are fed from one source. 317
Feed pipe must enter front head or top of shell and discharge downward between the tubes about 1/5 the length of the boiler from the front, 315.
Point of discharge must be below low water line
Steam Pipe must be supported. 305
Low Safe Water Line
Steel or Brass Bushing, 315.
Min Length
Feed Pipe must be supported. 315.
Boiler Pressure must be on top of valve discs, 314
Manhole Gasket must be not over 1/16" thick, and have 1/2" bearing. 263.
Min Solid Metal.
Threads per Table 7, page 68.
Drain to ash pit. 321
Boilers of over 50 H.P. require two mechanical means of feed, 318.
If valves "A" are used they must be Outside Screw & Yoke Gate Valves or Cocks with levers attached and must be locked or sealed open. 293
The numbers which follow notations refer to paragraphs of Boiler Safety Orders.
Blow-off must be of Extra Heavy Pipe, Min. 1", Max. 2½", 308, and fully protected from direct exposure to flame, 312. Pipe must be of one size from boiler to point of discharge, 310
Steel Elbow 310
MINIMUM REQUIREMENTS FOR NEW INSTALLATIONS OF HORIZONTAL RETURN TUBULAR BOILERS.
CALIFORNIA INDUSTRIAL ACCIDENT COMMISSION
Additional copies will be supplied upon request

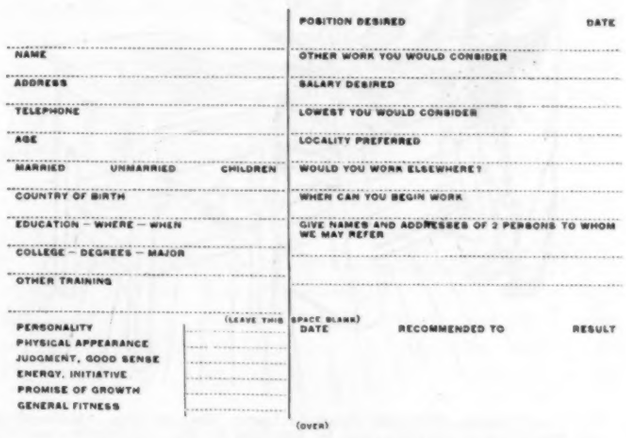
**SUGGESTIONS FOR SAFETY IN BOILER INSTALLATION**

**Helpful Suggestions for Safety in Boiler Installation have been put into concrete form by the California Industrial Accident Commission. Here is a reproduction of a drawing which has recently been made up to serve as a guide in the installation of boilers. Additional copies of this cut will be furnished to any one who is sufficiently interested in the subject to make application for them to the Safety Department of the Commission.**

# AN EMPLOYMENT SERVICE

There is no question but that the employment situation is a serious one. There is hardly a man in the electrical business who has not lost at least one employee through the war. The service records of some of our large establishments with their three and four hundred men in the National Army are truly imposing. The withdrawal of these thousands of employees has been met as best the labor situation permitted, but there are still many concerns which are short handed and many which are limping along with more or less unsatisfactory help temporarily handling the situation.

An echo of this need has been heard from time to time in the offices of the Journal of Electricity and with the material at hand, an attempt has been made to meet the situation. Wherever possible recommendations have been made, positions filled or found. The Journal believes that the time has come when


POSITION DESIRED DATE

NAME

ADDRESS

TELEPHONE

AGE

MARRIED UNMARRIED CHILDREN

COUNTRY OF BIRTH

EDUCATION – WHERE – WHEN

COLLEGE – DEGREES – MAJOR

OTHER TRAINING

OTHER WORK YOU WOULD CONSIDER

SALARY DESIRED

LOWEST YOU WOULD CONSIDER

LOCALITY PREFERRED

WOULD YOU WORK ELSEWHERE?

WHEN CAN YOU BEGIN WORK

GIVE NAMES AND ADDRESSES OF 2 PERSONS TO WHOM WE MAY REFER

(LEAVE THIS SPACE BLANK)

PERSONALITY
PHYSICAL APPEARANCE
JUDGMENT, GOOD SENSE
ENERGY, INITIATIVE
PROMISE OF GROWTH
GENERAL FITNESS

DATE RECOMMENDED TO RESULT

(over)

THE JOURNAL OF ELECTRICITY SERVICE CARD

This 4x6 inch card has been gotten out by the Journal of Electricity for the benefit of its subscribers. If you are looking for a position, write and enclose stamps for a card to be sent you. On the reverse side space is provided for your employment record with position, firm, length of service and salary. No charge is made for this service to subscribers.

that service should be made greater. With this in mind, a Service Card has been gotten out which will be furnished on application to any reader of the Journal desiring a position; man or woman. These cards are to be kept on file in the Journal of Electricity offices and recommendations will be made from them to employers in need of help.

This is not to be a mere Want Ad Exchange column. As can be judged from accompanying facsimile of the card in miniature, an attempt is made to keep a definite record of the availability of the applicant on all essential points. The back of the card is left blank for the experience record, information as to exact position, firm, length of service and salary being requested.

No charge will be made for this service. The usual fee of commercial employment agencies amounts to 25 per cent of the first month's salary, or 10 per cent of a year's; even non-commercial agencies elsewhere charge 3 and 6 per cent respectively. The Journal of Electricity wishes to donate this service free to its subscribers in the patriotic desire to meet a present need. If you need a man or a woman or if you yourself are in need of a position, the only question which will be asked of you is: "Are you a paid subscriber of the Journal of Electricity?" If so, the Service Department is at your service.

In addition to this offer through the columns of the Journal of Electricity, the Journal is in constant touch with the great universities of the West and with the membership of the many electrical societies and clubs who might furnish the men to fill the desired position, and an endeavor will be made to locate such prospects. Besides this work with the men, a considerable list of trained women has already been made out, many of them with experience back of them, some with university training, all ready to fill positions from office work to substituting in technical positions.

The present war situation has given rise to many problems. The natural tendency is to fill vacancies by advancing men from lower positions and to fill the least technical fields with women. But the men advanced will not always prove adequate to meet the higher position and men of a higher type of training and intelligence will have to be looked for. The groups of untrained girls are going to need supervision by a responsible woman in each case. New positions will develop.

If you are yourself looking for a position, write in at once enclosing stamps for the reply (don't forget it is 3 cents for out-of-town letters) and the card will be forwarded to you to fill out. If you are dissatisfied with the help you have found to fill your vacancies or if you have as yet found none, write in and perhaps the Journal of Electricity can help you out.

It has been truly said that the industrial army at home is fully as important as the army in the field for the winning of the war. The weakest link in the chain at present is that connecting those desiring positions with those looking for help. No haphazard methods of casual advertising or personal hearsay will adequately meet the need. More adequate, nation-wide bureaus which would handle questions of professional and technical employment intelligently are needed. The Journal of Electricity cannot, of course, at once reorganize our economic order, but it offers to do its share.

## THE AVIATION SIGNAL CORPS

Auto mechanicians, radio operators, electricians, magneto repair men, telephone linemen, telephone operators and adjusters and skilled workers of all sorts are needed in the Aviation Section of the Signal Corps of the U. S. Army.

Squadrons have been and are now being formed for service abroad.

BUSINESS BUILDING
SELLING IDEAS
DISPLAY

# WITH THE ELECTRICAL CONTRACTOR AND DEALER

CONSTRUCTION KINKS
COST KEEPING
ESTIMATING

## BREAD-AND-BUTTER BUSINESS

*(The manufacturer is in the field for second hand motors but he is not in a position to pick them up; whereas the contractor-dealer comes across many in the course of his business—the moral of the story hardly needs pointing. Here is a way of making the repairing, renting and exchanging of motors a part of your trade with practically no cost to yourself.—The Editor.)*

**What It Is:**

It is the little business—the kind that you pick up here and there by being alert, by keeping your mind active and on the job every moment of the day. It is the kind of business that the help in the store and your outside men can pick up for you.

It is exceptionally profitable because it is incidental, and it is capable of paying a good proportion of your employees' salaries.

The live electrical dealers already have their eyes open for this kind of business because it does not require money for exploitation. The only thing it does require is brains (alertness, ingenuity, and persistence).

**How to Get It:**

In the motor business there are three classes of

Even second hand motors can be made profitable

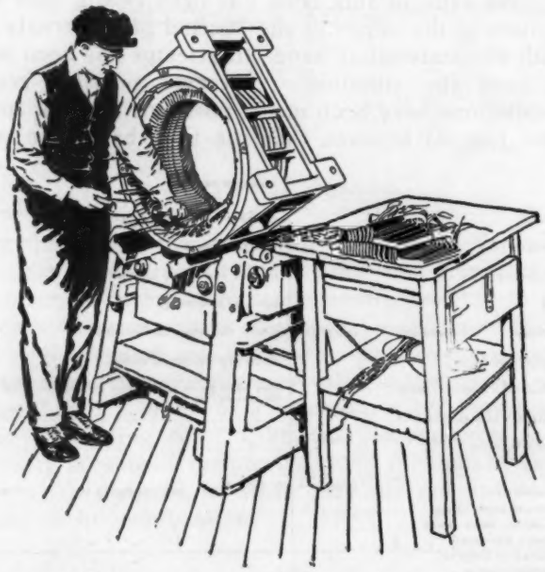
bread-and-butter business incidental to the sale of new apparatus, namely:

Buying second-hand equipment,
Making exchanges,
Rentals.

Electrical manufacturers in the West are making it possible for all electrical dealers to add to their profits through these three avenues. One big motor house on the coast has gotten out a circular offering to buy all second hand motors picked up by the dealer and contractor.

When one thinks of buying second-hand motors, one usually jumps to the conclusion that a large amount of capital is required. In this case the manufacturer furnishes the capital, for he will give you cash for second-hand motors.

Are you taking advantage of this and making money out of every second-hand motor for sale that you run across?



By co-operating with the manufacturer, the renting, exchanging and repairing of motors may be handled to the contractor-dealer's profit without risk.

Are you trying to find out where there are more second-hand motors for sale that you can make money out of?

Dealers are continually finding customers with small motors and wanting a larger one. To offer an exchange proposition will secure the business.

Are you alert to this and are you adding to your profits through this medium? You cannot afford to let this slip by when there is a firm in the business who will supply you or your customer with a new motor in exchange for the second-hand motor.

If you are an agent for some particular manufacturers' motor, you can buy the new motor from the manufacturer whom you represent, and the motor house referred to will take back the second-hand machine, giving you cash for it.

Probably the most attractive bread-and-butter business in connection with motors is rentals. There is a continuous stream of people who want to use a motor for a short space of time, perhaps one month, 2 months, or 6 months. Certainly you are not going to let this kind of business get by. Here is another chance to make money.

Are you making it known to your customers that you can repair their motors for them? Furthermore, are you making it known to your customers that while one motor is being repaired you can rent them another motor to keep them going?

You can rent a second-hand motor from the manufacturer at a special rate provided for electrical dealers and contractors, and in turn you can rent the motor to your prospect or customer. Here is a nice little commission and no investment is required. In addition you get the job of installing the motor, wiring it up, and probably taking it down again.

Further than this, many rentals are ultimately followed by a bona fide sale of new apparatus. If you have the rental, you get an inside track on the new business. Certainly you are not going to let this slip by.

This rental business is so attractive that some electrical dealers and contractors are advertising, "We stock motors for rentals as well as sales. Prompt service is our aim. A telephone call will bring our representative."

Have you ever thought of doing this? Why not act on the impulse and do it now? You can obtain illustrated electrotypes specially designed for this purpose from some of the electrical manufacturers.

If you handle motors at all make it your boast that you can negotiate all kinds of motor business. The general thought applies to other phases of your business as well as motor business.

## SILHOUETTE HIGHWAY LIGHTING

BY S. J. LISBERGER

Usually speaking, under California conditions, our counties and our cities have very little money to spend on lighting. In doing highway work, therefore, the electrical man must face the fact that the county, or the consumer is unable to light the highway as he would like to have it lighted, and as you would like to light it for him. And therefore you must be very careful in endeavoring to plan your lighting system, to see that you do not light the highway uniformly. Uniform lighting, unless it is of high intensity, is a flat failure. So long as the financial conditions are such that plenty of light is not available you must resort to what we term "silhouette" lighting; that is the placing of a light on a highway in such manner that objects can be distinguished in silhouette, not by so-called direct illumination. That allows you to use a unit of reasonable intensity, reasonable spacings, and gives a fairly good result.

In one community we had certain districts down along the peninsula highway, starting out from the San Francisco city limits and coming down the highway, where in the past they had used 32 candle power lamps. Now, the illumination from 32 candle power lamps spaced as they were, practically on every pole, was very, very poor. Really the economical unit on street lighting systems is practically a 250 candle power unit. That is, in other words, it practically does not pay to put in much less than that, because your pole, your wire, your fixture, which are the main constants going to make up your lighting charge, are irrespective of the size of lamp which you put in the unit, or in the fixture, and the only thing that varies is the amount of power, the extra cost of the renewal of the unit itself.

By using 250 candle power lamps with refractors spaced on every pole, we demonstrated what effective silhouette lighting would do, switching on the old and new systems alternately to give the contrast. They not only changed every light along the highway, but their bills were reduced. Silhouette lighting does not look good in your machine if the other fellow has a headlight on but is extremely effective with headlights turned off.

**A POSSIBILITY** of new business for the electrical contractor and dealer is suggested by the attractive lighting of the Laurelhurst Club House in Portland, Oregon. Three flood lights are used, containing three 400 watt units mounted on a distributing pole of the power company. Eight other units are used for the flood lighting of the tennis courts and grounds.

**CHRISTMAS ADVERTISING**

**The value of advertising through window displays, demonstrators, newspapers and special sales can hardly be overemphasized. The man you buy from is just as interested as are you in seeing that your stock is sold. He stands ready to offer window exhibits, sales hints and material for newspaper advertising.**

# Western Ideas

**ELECTRICAL MONKEY BUSINESS** not only proved an ingenious scheme for gathering a crowd of spectators but in addition effectively brought out the indestructibility of the Mazda lamps. The Central Electric Company of San Francisco in their exhibit at the recent Land Show made use of a monkey in a good sized cage with several electric lamps protected by wire guards suspended from the top by substantial cords. These formed the basis of the exhibit—the monkey did the rest. In his antics he threw the lighted lamps about the cage, climbed up them, poked his fingers into them and dropped them in turn. Occasionally when the presence of spectators annoyed him, he threw a lamp at them as far as the cord would allow. And through it all, the lamps burned steadily. A legend which ran "You can monkey with a Mazda lamp" carried the idea home—and the little cards which bore the message conveyed the further information as to the location of the establishment and the stock carried. Not one of the many spectators but conceived a new idea of the durability of the tungsten filaments.

YOU CAN
WITH
SUNBEAM NATIONAL MAZDA LAMPS
and they don't break easily
We installed the lights in the Land Show
WE STOCK ALL SIZES OF LAMPS
10 to 40 Watt 27c. 75 Watt - - 65c.
60 Watt - - 36c. 100 Watt - $1.00
200 Watt $2.00
DISCOUNTS ON QUANTITIES
WE DO WIRING
CONTRACTORS
CENTRAL ELECTRIC
CO.
AND DEALERS
175 JESSIE ST NEAR 3RD
SAN FRANCISCO CALIF
TELEPHONE DOUGLAS 387
Put me away until you need Lamps

**CHRISTMAS WINDOWS** like any other form of advertising require a plot and a special direction of appeal. The essential thing to bear in mind is the mental picture you desire produced. In a word, as brought out by H. A. Lemmon, of the Reno Light and Power Company of Nevada, in his excellent papers published in the columns of the Journal of Electricity for Aug. 15 and Sept. 1, 1917, if you wish to sell me an article for my own use that everyday necessity doesn't demand, you must lead me to form a picture in my mind in which I and the article itself form the principal parts, and the picture must be one in which I seem to be deriving great benefit and pleasure from possession of the article.

In our anxiety to achieve artistic effects and holiday atmosphere in our Christmas window displays, do not let us forget that, first of all, a sales window is an advertisement. It should therefore partake of all the features of an advertisement with the chief purpose in view—to sell goods.

First consider **the space.** A publisher sells you good, plain white space—he doesn't color it up to make it attractive or daub it with splotches of ink to attract attention. Treat your window the same way. Clean all the junk out of it, dust it up and, if necessary, give the woodwork a clean coat of paint. Use a simple, unobtrusive background that will not distract attention from the goods.

The next point to consider in an advertisement is **the illustration.** In a window this feature is supplied by the goods themselves. Arrange them in a logical or orderly manner, giving the proper prominence to the most attractive.

**The headline** is the next consideration. This should always attract favorable attention and, if possible, should contain a selling point. In some cases a window card or strip will be needed to take the place of a headline in a window, but frequently some portion of the display itself will serve this purpose.

**The copy** or body matter of the advertisement is the most important part of all, for it is here that the favorable attention is crystallized into desire, decision, and action. In a window display the copy is represented by the goods themselves and their selling points which should be indicated by little cards, tags, or placards. In some cases the prices themselves constitute selling points and assist the prospect in arriving at a decision.

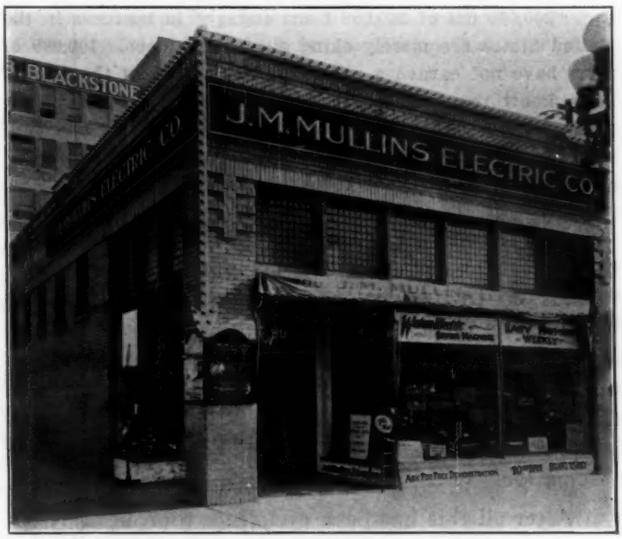
The above points have been brought out to assist window dressers in arranging windows that shall be **sales** windows in the strictest sense of the word. Every one of the features mentioned should be in every window, although they need not necessarily be separate. In many well arranged windows the goods themselves with their prices can be made to serve as

**FOR CHRISTMAS SALES**

**Advertising copy and electrotypes for use in your local paper are furnished free of charge by many of the electrical manufacturers and jobbers. Cuts similar to those shown across these two pages may be obtained in suitable sizes for newspaper use in your own paper as suggested below or in paid advertising.**

both illustration, headline, and copy—combining in themselves and their arrangement the functions of all.

**A PRE-HOLIDAY WINDOW** display, and special sale of electric sewing machines has been bringing in business for one electrical dealer on the Pacific Coast. The J. M. Mullins Electric Co. of Los Angeles,




A pre-holiday sale of sewing machines

which recently occupied a new store in the retail shopping district, filled its large display window with electric sewing machines of a well known make, having some of the machines uncrated and on tables ready for service, while quite a number of machines crated in the back of the window showed that the dealer had ample stock to carry out his scheme. Large attractively worded cards in the window issued the statement "Don't wait till Christmas to Buy Gifts — Buy an Electric Sewing Machine Now — make a deposit and we'll hold the Machine until Christmas." The window was placarded with banners advertising the sewing machine at easy weekly payments. By offering the use of the machines on display to the French Red Cross Society, an effective demonstration of the use of the machine was combined with a patriotic service. The sight of operators from that society busily engaged in making hospital shirts added greatly to the sales value of the window. That the display paid is evidenced by the statement from the dealer that deposits were made on quite a number of machines which are to be delivered as Christmas presents.

**A STORE PAPER** is made use of by an up-to-date dealer of Gardnerville, Nevada. The paper is a four-page sheet, 11 x 14 inches and contains advertisements of the stock carried, local news items, jokes, recipes and well written articles on such subjects as

1c Paid
Gardnerville, Nevada.
Permit No. 1

HOWARD'S STORE NEWS

Published By
HOWARD BROS.

Gardnerville, Nevada. Phone 151

NOVEMBER, 1917

**Many a Man Has Regretted. Have You?**

Many — many, times we have people tell us that the last lot of merchandise or some article that they sent away for was not worth the postage it took to get it here. Of course it wasn't. In this day and age we all know that we can not get something for nothing, the best we can buy is always the cheapest. Why not buy at home where you can see the article you are buying and are not buying from a picture—ainy article looks good in a picture.
WE GUARANTEE EVERY ARTICLE WE SELL YOU AND ALWAYS SELL FOR LESS.

INSTRUCTIONS FOR ADDRESSING MAIL MATTER TO SOLDIERS AND SAILORS AT THE FRONT.

It is suggested that the following instructions, approved by the United States Postal Authorities be clipped and preserved for future reference.

Mails addressed to soldiers at the front should bear the name of the soldier, the unit of service to which he belongs, and the words "U. S. Expeditionary Forces," the post-office or locality being shown on the envelope or wrapper.

In the case of Sailors, the name of the Sailor and that of the boat should be placed on the envelope or envelope, but no other address.

Packages for Soldiers and Sailors should be prepaid at the 5th zone rate, (12c a pound) and 1½c for every fraction of a pound ... preceding the last weight.

Packages cannot be registered, insured or sent C. O. D. No Customs declaration is required.

In order to reach the troops by Christmas packages should be mailed on or as soon as possible after November 15.

OPTIMISM.

The tide has turned. Having run more than half way into the woods—the rest of the way American business is running out of it. Many people still would rather talk pessimism than fill orders. As an example of pure unadulterated optimism, we heartily recommend the following item, which was dug up by the Riker Record:

"Top letter today. Glad you bought a pair of horses. Hilda is sick. She has diphtheria, and she will die. I think. Chas died this eve. She had it, too. We are quarantined. Five of Baker's family have got it. My wife is sick. She hasn't got it. If the thing gets much worse we may have to get a doctor. Then trade is budding good. Everything is O. K."

Don't be the man who put the oil in city.

RUB A DUB DUB - YOUR CLOTHES IN A TUB

Wears out the clothes, breaks buttons, tears finery.

The old-fashioned clothes washing method is the most expensive so-called "economy."

IT WILL Pay You To Consider

Washing by Electricity With a Western Electric Washer and Wringer

Wash Electrically.

Let Us Tell You How!

FOR SALE BY HOWARD BROS.

An effective advertising medium

"Why you should trade at home." The paper is exceedingly readable and provides an effective medium for the use of such advertising matter as is provided free of charge by jobbers and manufacturers. By featuring always some one of the electrical devices carried on the front page, Howard Bros. have succeeded in building up a substantial electrical business in a short time.

## THE JOBBER AND THE CONTRACTOR-DEALER'S ASSOCIATION

BY W. S. BERRY

*(The reasons why a contractor-dealer should belong to a contractor-dealer's organization are here presented from the viewpoint of a jobber. If not to join such an association will mean that the contractor is looked upon as unprogressive and a questionable business risk by the concern which is extending him credit, he can ill afford to resist the prevailing spirit of co-operation. This helpful article is part of an address given before the Washington Association of Contractors and Dealers in Spokane. The author is western salesmanager of the Western Electric Company.—The Editor.)*

Three years ago a joint committee of contractors and jobbers found it necessary to preface their report on "co-operation" with the statement:

"It is a recognized fact that certain branches of the electrical industry are today in a very demoralized condition."

Two of the biggest problems at that time were the destructive competition then existing in the contracting business, and the jobbers' loose methods of extending credits to unbusinesslike contractor-dealers who were already in the field or the opening up of new accounts with wiremen who had no business experience or capital, but who thought they would like to take a chance at the contracting game. These two difficulties of course were dependent on each other—and together brought about a congestion in the industry, which was bound to make most of the electrical contracts unprofitable, not only to the new people entering the field but also to such good concerns as were already trying to make a profit. The question was, how to lessen this evil and do it legally. Jobbers could not get together and discuss whether or not they should sell John Doe & Company, nor could a jobber discuss John Doe & Company along this line with one of his own customers, for, as we all know, this would be absolutely against the laws of our country. If a jobber and a contractor took a chance, and John Doe & Company could prove that, owing to such a conversation, the jobber refused to sell them, they would have ample cause for damages against both jobber and contractor. Therefore, to determine who would be a desirable or undesirable customer was somewhat of a proposition, and entailed months of hard work.

It became the problem of each jobber to educate himself, and in most cases reverse the policy which he had long been following, of figuring that the more contractor-dealer customers were on his books, the greater his volume of business and hence the greater his profits. An analysis of past accounts clearly showed that only a few of this class of customers were making a living, and none were saving money for the future, as our friends among the contractors could not make a success on account of the competition from concerns who knew very little about their cost of doing business, figuring jobs and installing work efficiently and economically. We, therefore, each year had to write off big losses caused by bankruptcy of this class of trade.

The Contractor-Dealer Associations have materially helped this situation, so that it has become part of our policy to educate our salesmen so they could not only be a help to their customers in other ways than selling, but also be a help to the Contractor-Dealers' Association to increase their membership. Of course, in thus supporting these associations, urging our customers to join and suspecting the credit of such as did not, we first had to convince ourselves that the Contractor-Dealers' bylaws were legal in every way, especially as to discrimination against competitors.

It has become our policy to explain to the non-member contractor-dealer the good that could be obtained through Association work, under the Constitution and By-laws as generally adopted on the Pacific Coast, which assure reasonable membership fee and annual dues, and to bring repeatedly to their attention that part of the report of the Federal Trade Commission, which was as follows:

"200,000 out of 260,000 firms engaged in business in the United States are merely eking out an existence. 100,000 of them have not earned a penny, and only 10% of the 200,000 firms know the actual cost of handling and selling their product. 40% of them merely estimate their costs and 50% have absolutely no idea of their cost, but merely hap-hazardly guess and establish their costs arbitrarily."

I have found no one who doubts the accuracy of this report, and it is another argument why, in order for the contractor-dealer to make a success of his business, he must do everything possible to exchange ideas with his competitors as to the best methods to make his business profitable, as it is acknowledged that only in rare instances can a man work out all his problems without experienced help or through an association.

After all this has been gone into thoroughly with the contractor-dealer, it is my belief that one who will not join an association of his own craft is handicapping himself, and therefore is a credit risk that should be carefully watched, as almost invariably the account is a losing one to the supplier. There are a few exceptions which only prove the rule.

During the past three years much has been accomplished by the jobbers towards eliminating doubtful contractor-dealer accounts on their books, and as the jobbers are generally convinced that they can only prosper in proportion to the prosperity of their customers, they are not so anxious to establish in their territory new concerns who are apt to make it next to impossible for those already engaged in the industry to return a reasonable profit. As to present conditions, I can point to many cities on the Pacific Coast where the contractor-dealers are making money, and are among the coming citizens of their respective communities, and only a few cities where practically no progress has been made.

## MARINE WIRING

*(With the great impetus in shipbuilding, the question of electric installations on shipboard is demanding attention. Vessels intended for use by the various allies must be wired under different rulings which it is important for the contractor to know. The following rules of the American Bureau of Shipping govern the wiring of wooden ships now being constructed for the American government. —The Editor.)*

There are various rules promulgated by the different vessel classification bureaus under which vessels are classified.

The rules most generally used are the following:

(1) American Bureau of Shipping, Nos. 60-70 Beaver Street, New York City. All the U. S. Government wooden ships are being constructed under these rules.

(2) Bureau Veritas. Wooden and steel ships being built for the French Government are being constructed under these rules.

(3) Where U. S. Steamboat Inspection Service is maintained, on both river boats and ocean and coastwise boats, forms 801A and 801D and American Bureau of Shipping rules are observed.

(4) Lloyds' Register of Shipping. Used by nearly all of the Allies except French boats which are under the Bureau Veritas, also many boats built for the United States use this register.

(5) National Electrical Code. Used in the United States to some extent.

### Rules for the Installation of Electrical Equipment

The following Rules for the Installation of Electrical Equipment on board Vessels have been suggested by the Marine Committee of the American Institute of Electrical Engineers, and have been adopted by the Committee of the American Bureau of Shipping.

(1) **General.**—All apparatus and appliances such as generators, motors, wire, switches, circuit breakers, cut-outs, etc., shall strictly conform in every respect to the Standardization Rules of the American Institute of Electrical Engineers and the National Electrical Code and such special rules under Marine Construction Requirements contained herein.

No wood must be used for any purpose in any part of the installation.

The two-wire or three-wire complete metallic system of distribution is approved. The single wire system of distribution is disapproved.

In vessels carrying petroleum or any substance giving off an explosive gas no permanent conductors must be installed in any compartment liable to contain such fumes. Portable lamps of approved gas-tight construction may be temporarily used in pump room but the portable wire must be armored and the attachment made outside the pump room. All the metallic rigging of such vessels must be carefully and effectively grounded to the metal hull.

Generators, or storage batteries, required for emergency lighting and power, must be located as far above the load water line as possible. Storage batteries must be properly ventilated and regularly inspected.

(2) **Distribution.**—All main and distribution switchboards must be made of approved non-combustible, non-absorptive, insulating material. Distribution panels must be totally enclosed in metal cabinets. Every circuit leading from a switchboard of distribution panel must be protected by an approved automatic circuit opening device and switch.

Distribution panels must not be located in inaccessible places or such compartments as bunkers, storerooms, cargo holds, or compartments allotted alternately to passengers, live stock, and cargo. They must be so located that the load on one cut-out shall not exceed 660 watts except in the case of motors, searchlights, diving lamps, and electric heating devices.

The method of distribution for cargo spaces must be such that each freight compartment is separately controlled outside the compartment so that the electrical current shall be cut off when the vessel is under way.

(3) **Installation of Wires.**—All electrical conductors must be protected by one of the following methods:

(a) Armored with metal bands, with or without lead.

(b) Armored with metallic basket-weave braid, with or without lead.

(c) Plain braided wires enclosed by iron casing.

(d) Drawn into metal conduits—either rigid or flexible.

(e) Placed in metal moulding.

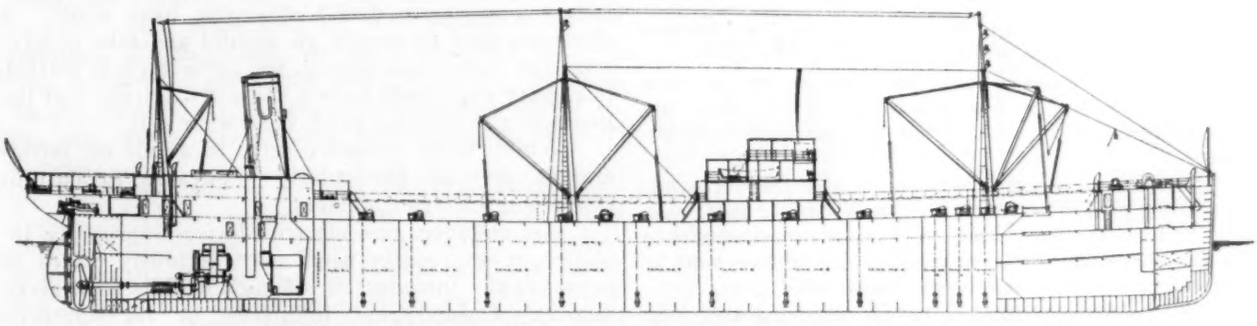
No splices or joints in wires are permitted. Connections must be made by means of approved connection blocks mounted in metal boxes. These appliances must not be located in coal bunkers or other inaccessible places.

Wherever the conductors, protected by flexible metal conduits, metal moulding, or armored metallic bands or braid, are exposed to severe mechanical injury, they must have an additional metallic protection.

(4) **Generators and Motors.**—Generators and motors must be located so as to avoid proximity to steam, water, or other piping, or to be properly protected, from damage coincident thereto.

Name plates must be provided on this apparatus giving the maker's name, rating in revolutions per minute, volts, amperes and kilowatts or kilivolt amperes. The type whether shunt, series, or compound-wound must also be stated.

If the motor starting box does not completely break the motor circuit a switch breaking all poles must be installed between the feeder and the starting box.



The cross section of an ocean liner showing the location of motors for use in handling the cargo

Hand rails must be provided around generators, and similar protection given open type motors if employed.

(5) **Switchboards.**—Main switchboards and distribution switchboards where exposed to mechanical injury, and moisture, must be properly protected. Such switchboards must be accessible from all sides.

For the control of the generator or generators a main switch, circuit breaker and ammeter must be provided for each machine. One voltmeter arranged with switch so that it may read the voltage of all generators and one set of ground detector lamps must be provided. (Separate voltmeters for each generator will be allowed.)

Hand rails with hickory or other approved insulated top must be provided in front of switchboards.

The signal lights must be controlled by an approved telltale board located in pilot house which will indicate a burned-out lamp. Each side of all signal circuits must be brought to this board and fused at this point. The feeder for this board must be continuous from the main switchboard and must not supply any other circuits in the vessel.

Distribution panels located in places not exposed to the weather may be enclosed in non-watertight metal cases. Distribution panels located on the weather deck or placed exposed to the weather must be enclosed in watertight metal cases.

(6) **Installation of Wires.**—All conductors larger than No. 14 B. & S. gauge must be stranded. Except for fixture wiring and signaling systems no single conductor smaller than No. 14 B. & S. gauge shall be employed. No. 16 B. & S. gauge wire may be used for fixture and signaling wire, but in signaling systems energized by over 25 volts the insulation must comply with the requirements for the voltage employed. Bell wires must not be run in conjunction with light or power wire.

All conductors must be led through metallic stuffing tubes when passing through watertight bulkheads, and through all decks. Stuffing tubes through decks must extend to a height of 18 inches above the surface of the deck.

In conduit construction the conductors must not be "pulled in" until all the mechanical work on a given section has been completed. Pull boxes must be installed at sufficient intervals to permit pulling in the conductor without injurious strain. Pull boxes to be of watertight construction and allow an opening in the box at least ten times the diameter of the conductor contained therein.

In armored cable installations, all cables liable to be exposed to weather or moisture must be lead-covered, or otherwise specially protected. They must be carefully "laid" with no short or sharp bends and secured with screwed clips spaced not more than 14 inches apart. Where cables pass through beams, decks, bulkheads, or any part of the metal structure not requiring a stuffing tube the hole through which they pass must be bushed with lead or other material that will not permit chafing or corrosion to take place. No lead-covered, steel-armored cable over one and one-half inch outside diameter to be employed.

Twin conductors up to 60,000 circular mills may be used for all types of installation.

Portable conductors must be made of two or more stranded conductors not less than No. 14 B. & S. gauge laid together and provided with an approved insulation and covering.

On vessels carrying radio telegraph apparatus, all permanent wiring in the radio room and above the top metal deck must be magnetically shielded. Any protection placed around the antennae leads to prevent ready access to same must be of metal, permanently and effectively grounded.

The insulation resistance of the completed wiring installation must conform to the requirements of the National Electrical Code.

The size of all wiring and cable conductors must be in accordance with the following Table of safe capacities:

| No. of Wires or Strands | Size of Wires or Strands B. & S. Gauge | Capacity in Amperes | No. of Wires or Strands | Size of Wire or Strands B. & S. Gauge | Capacity in Amperes |
|---|---|---|---|---|---|
| 1 | 19 | — | 19 | 17 | 60 |
| 1 | 18 | 3 | 19 | 16 | 70 |
| 1 | 17 | — | 37 | 18 | 85 |
| 1 | 16 | 6 | 37 | 17 | 100 |
| 1 | 15 | — | 61 | 18 | 120 |
| 1 | 14 | 12 | 61 | 17 | 145 |
| 1 | 12 | 17 | 61 | 16 | 170 |
| 7 | 19 | 21 | 61 | 15 | 200 |
| 7 | 18 | 25 | 61 | 14 | 235 |
| 7 | 17 | 30 | 91 | 15 | 270 |
| 7 | 16 | 35 | 91 | 14 | 320 |
| 7 | 15 | 40 | 127 | 15 | 340 |
| 19 | 18 | 50 | | | |

(7) **Suggestions.**—Great care should be exercised in running electric leads in the vicinity of the magnetic compasses. If the leads carry large currents, in excess of 100 amperes, they should be crossed.

It is strongly recommended that all metal work above the top metal deck, including metal rigging for all masts and funnels, be permanently and effectively grounded. All short exposed flexible leads, such as those to searchlights and running lights, should be provided with a metallic shield well grounded to the hull of the vessel.

It is recommended that a switch be placed in the ground detector circuit on the main switchboard so that this ground connection may be broken when it is desired to test out the various circuits in the vessel.

It is strongly urged that a complete test of the insulation of the entire electrical equipment be made at least every six months and a copy of report forwarded to this Bureau.

## HOW TO REDUCE THE COST OF MERCHANDISING

BY W. M. DEMING

That the relations between the manufacturer and dealer are a serious problem in other lines of industry as well as in the electrical field is indicated by the comments of a manufacturer of refrigerators during a recent discussion of present-day business conditions from a merchandising point of view. He said:

"It has gotten so we not only have to figure on what's good for us, but what's good for our dealers also. We sell them a line of refrigerators—then have to go into their stores personally and show the clerk how to handle customers and sell our goods, then show the manager how to advertise. We give him window displays. We may get our money right off the bat, but the sale isn't really closed until the goods have been sold by the store and found satisfactory by the housewives. We then have to follow our goods into the homes, for if one refrigerator proves unsatisfactory, the woman of the house starts talking and kills ten sales we would otherwise have made. A salesman used to merely go around and take orders: once the order was signed, we considered it settled, but today everybody is in a sense a salesman and the goods are a liability until they wear out."

While these remarks refer to a line of refrigerators, they are particularly applicable to current consuming electrical devices.

For instance, one electric device improperly installed or improperly used may seriously retard or even kill the introduction of such devices in a given district. Unintelligent, indifferent or inexperienced handling of a prospective user may have equally serious results.

Sales of electrical appliances for the home in 1916 exceeded sales for 1915 by more than 100% and there is a rapidly growing realization in the minds of the public that such appliances are an important factor in solving the servant question. In many cases a well-selected assortment of electrical devices, in conjunction with proper instructions as to their use, has enabled the housewife to dispense with servants and still not be subject to the drudgery of housework incident to old-fashioned methods.

The central station in seeking ways to increase the use of electrical energy from its lines entered the merchandising field to insure suitable exploitation of current consuming devices in its territory. The manufacturer naturally welcomed and encouraged any plan which tended to increase the demand for his product.

It would seem therefore that a material saving to all concerned, through reduction in the cost of merchandising, could be effected if the electrical dealer would make a careful study of the essential requirements from the central station and manufacturer's viewpoint, necessary for the successful exploitation of current consuming and other electrical devices. The central station can also do much toward improving conditions by giving local dealers active support and allowing them to become acquainted with and profit by its own experience.

## SPECIAL LIGHTING FOR MULTNOMAH FIELD IN PORTLAND

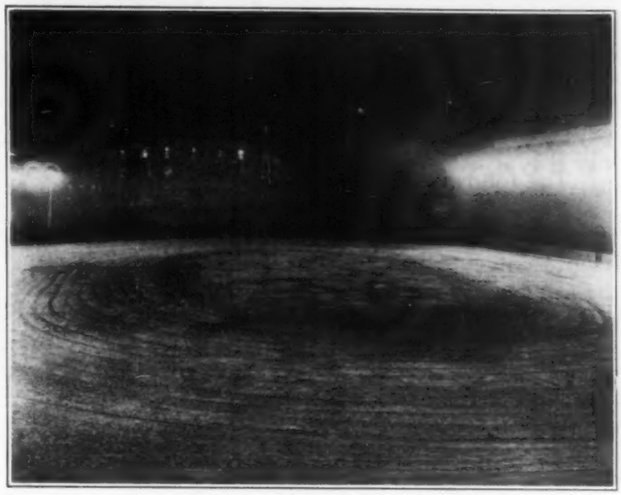
BY F. H. MURPHY

*(Even the winter does not interrupt the outdoor drilling and athletics in the West. Fields designed for the use of Home Guard units as well as outdoor tennis matches and the like which must be staged at night, present an interesting problem in lighting. The example of this Portland field where various methods were experimented with should prove helpful. The author is illuminating engineer with the Portland Railway, Light and Power Company.—The Editor.)*

For some time the proper lighting of Multnomah Field, so as to enable the staging of evening events at that place, has been in the minds of a number of people. However, nothing definite had resulted until early this summer. It is true that a feeble attempt had been made to give some lighting to the field by means of two messengers strung across the field supporting eight carbon arc lamps about 30 to 32 feet above the ground. This, however, was very unsatisfactory for any purpose.

Early in the past summer it was decided to stage a Western Round Up on the field, giving both afternoon and evening events. This made it absolutely necessary that something be done in regard to the lighting. Furthermore, the field was even at that time being used practically every night for the drilling of Home Guards and the lighting supplied by the arc lamps was entirely unsatisfactory for this purpose.

Since the field is used for baseball and football games, as well as for other athletic purposes, it was deemed unadvisable to permit overhead messengers of any nature, even at a height of 60 or 70 feet above the ground. This, therefore, meant that the lighting must be done from the sides. Flood lighting units were at first considered but were almost immediately eliminated because of high first cost of installation. The method finally adopted consisted of 26 1000-watt units, 13 upon either side of the field and mounted approximately 45 feet above the ground, the spacing between units being about 25 feet. On the grandstand side of the field the units are mounted immediately beneath the edge of the roof. On the opposite side of the field three poles were erected and the units suspended from a 5/8 inch messenger cable supported by the poles.



READY FOR THE ROUND-UP

The Multnomah field as lighted for the night performance of a Western Rodeo. In the Home Guard drilling, the lights on only one side of the field are lit. Note the absence of overhead wires and equipment which would interfere with the daylight use of the field for football.
for football.

The average illumination over the field, as shown by a recent test made upon a 36 inch plane, is 1.55 foot candles, whereas the average illumination in the area in front of the grandstand in which special roping features and other special events were staged, is 2.786 foot candles. This illumination proved sufficient for the various Round Up events and the public was very well satisfied with the result.

On drill nights the illumination is turned on on one side of the field only, this giving sufficient light for such purposes.

The cost of the installation was approximately $23.55 per unit.

The field is approximately 450 feet long by 270 feet wide, and this represents the first installation, so far as the author is aware, in which a permanent installation has been made in the West of such a nature as to successfully stage a Western Round Up event.

## ADJUSTABLE SOCKETS IN LIGHTING

BY J. W. MORRIS

The problem of connecting up a small series lighting system comes up all the time where you have a 2200-volt line running, and you have to take in possibly one or two blocks of 20 or 30 lights.

The adjustable socket system meets the difficulty without involving the coil regulator where there are a couple of blocks that you want to give series lights. The adjustable socket system consists of a lighting transformer, and across each lamp a little reactance coil, which, if the lamp burns out, takes up the voltage of the lamp.

## OREGON ASSOCIATION OF CONTRACTORS AND DEALERS

A special meeting of the Oregon Association of Electrical Contractors and Dealers was called on November 17, 1917, by J. R. Tomlinson, chairman of the Committee on Permanent Organization, for the purpose of adopting a new constitution and by-laws. In the absence of the president, S. C. Jaggar, vice-president, presided and presented his report upon the Convention of the National Association held at New Orleans.

The following resolutions were adopted:

**Be It Resolved,** That the Oregon Association of Electrical Contractors and Dealers does hereby amend its present constitution and by-laws by substituting the attached copy (which is hereto attached and made a part of this resolution) of the Constitution and By-Laws of the National Association of Electrical Contractors and Dealers together with the prescribed form of the State Constitution and By-Laws, in accordance with the legislation enacted at the Annual Convention of the National Electrical Contractors' Association held at New Orleans, October 11th, 1917.

**Be It Resolved,** That in accordance with Article V, Section I of the Constitution, that the State of Oregon be comprised of three districts as follows: District I shall be all that portion of the state lying west of the Cascade Mountains and north of the 45th parallel of latitude including Salem, Oregon, District II all that part of the state lying west of the Cascade Mountains and south of Salem and the aforesaid parallel, and the third District all that part of the state lying east of the Cascade Mountains.

**Be It Resolved,** That the membership fee of the Oregon State Association of Electrical Contractors and Dealers shall be $25.00.

**Be It Resolved,** That the annual dues of the Association shall be as per following schedule and classifications:

| | | National. | State. | Total. |
|---|---|---|---|---|
| CLASS A. | Less than $12,000 annually | $ 5.00 | $35.00 | $40.00 |
| " B. | $12,000 to $25,000 " | 7.50 | 40.50 | 48.00 |
| " C. | $25,000 to $50,000 " | 10.00 | 50.00 | 60.00 |
| " D. | $50,000 to $100,000 " | 20.00 | 60.00 | 80.00 |
| " E. | Over $100,000 " | 30.00 | 70.00 | 100.00 |

Dues to be paid quarterly in advance on or before the 15th of January, April, October and July.

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**Mr. J. Willis Oberender has been retained as the State Secretary-Treasurer of the Oregon State Association of Electrical Contractors and Dealers. Mr. Oberender has held the same position for the State Association since its inception, Feb. 9th, 1915, and has devoted the greater part of his time to association effort. He is a native son of the State of Oregon and for many years was employed in the Motive Power Department of the Southern Pacific Company. In 1912 he was admitted to practice by the Supreme Court of Oregon, and has ever since that time been engaged in the practice of law. Mr. Oberender will hereafter devote practically his entire time to Association work. He has recently entered as a contestant from Oregon in the Journal's subscription campaign.**

**Allen S. Halls, whose election as State Chairman of the Oregon State Association of Electrical Contractors and Dealers was confirmed at the meeting held Nov. 17th at the Multnomah Hotel, is the managing engineer of the National Electric Company with offices at 517 Railway Exchange Bldg., Portland, Oregon. Mr. Halls has had broad experience in electrical construction work of all kinds, and the members of the Oregon Association feel that they are exceedingly fortunate in securing his services as State Chairman. Mr. Halls was formerly a member of Miller & Halls, electrical contractors of Portland, and also at one time Northwest Manager of the Pacific Fire Extinguisher Company and has held several other positions of trust requiring expert knowledge of electrical construction work.**

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**Be It Resolved,** That it is the will of this meeting that all officers elected at this meeting and at the executive committee meeting to be held immediately after the adjournment of this meeting shall hold their respective offices until the annual meeting in the year 1919 or until their successors are elected and qualified.

The election of members of the executive committee resulted as follows: District I, J. R. Tomlinson unanimously elected, B. W. Paul elected by a majority for District II. No member of the third district being present, this was referred to executive committee for action.

At a later meeting of the executive committee J. L. Vaughan was elected a member of the executive committee from the 3rd district. Allen S. Halls, president of the Association, was unanimously elected chairman of the state executive committee and S. C. Jaggar as delegate for the State of Oregon to the Pacific Division. J. W. Oberender was retained as Secretary-Treasurer.

Standing committees were appointed as follows:

**Membership, Finance and Program Committee**—J. R. Tomlinson and A. C. McMicken.

**Legislation and Publication Committee**—B. W. Paul, J. L. Vaughan and R. G. Littler.

**Jobbers and Manufacturers Committee**—A. S. Halls and H. H. Sroufe.

**Central Stations Committee**—J. R. Tomlinson and F. C. Green.

**Educational and Costs Data Committee**—A. S. Halls and C. P. Scott.

The following firms were represented at the special meeting: F. A. Bauman & Co., Beaver Electric Co., E. L. Knight & Co., A. E. Messerve, Morrison Electric Co., NePage McKenny Co., Pierce Tomlinson Electric Co., Scott Electric Co., Sturges & Olsaver, Vanderlip & Lord, M. J. Walsh Co., West Coast Engineering Co., Western Electric Works, Apple City Electric Shop, Comet Electric Co., Roseburg Electric Co., and B. W. Paul, and Associate Members: Portland Railway, Light & Power Co., and Portland Electrical Maintenance Co.

# Technical Hints

BY GEORGE A. SCHNEIDER

*(There is an increasing demand for remote control switches for the control of lighting and power circuits in theatres, public buildings and the like, and this information on the various types which are on the market, their advantages and disadvantages, will prove helpful to the wide awake contractor-dealer. The difference between a successful time clock and an unsuccessful one is further shown to depend on two or three simple conditions which it is worth while noting in the installation.—The Editor.)*

## REMOTE CONTROL SWITCHES

Remote control switches are now extensively used for the control of lighting and power circuits in theatres, factories, central stations or similar installations where it is desired to control circuits, carrying heavy currents, from a distance and where it would be too expensive to run the main leads to a remote point of control. Certain types are also very largely used for the control of motor circuits.

For convenience in discussing the common types which are of interest to the contractor and dealer these switches may be classified as follows:

**(a) Electrically operated; mechanically held. This type has two operating coils — one coil for closing and one for opening—but is mechanically held when closed. Coils are in circuit only at instant of opening or closing.**

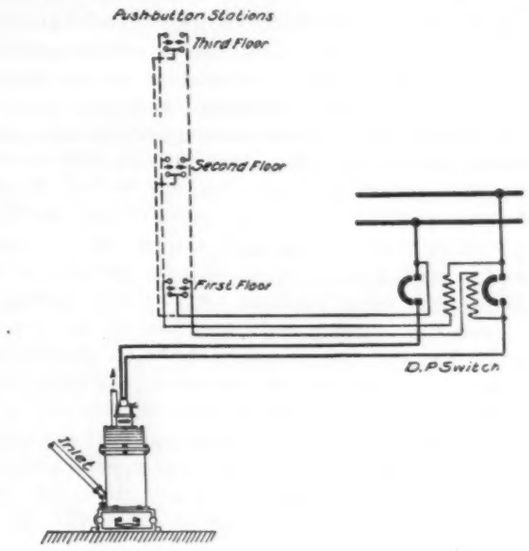
**(b) Electrically operated; electrically held. This type has only one operating coil which closes switch and holds it in a closed position. Coil is continuously excited as long as switch is closed.**

**(c) Manually operated; mechanically held. This type has one coil only for the purpose of tripping switch to open. Coil is in circuit only at instant of tripping. Switch is held mechanically when in closed position. Usually switch is only opened in emergency.**

There are a number of switches in the market which are in accordance with each of these various classifications. One of the the most popular types which operates as outlined under (a) is designed much on the order of a standard line of air circuit breakers, in fact, some of the breaker parts are used in the remote control switches. This switch is operated by a double-coil solenoid—one coil for closing, one for opening—controlled by a special, single-pole, two-circuit, push button switch which is normally in the open position and remains closed only when held by the operator. To open or close the switch the corresponding push button has to be pushed in. One of these switches is furnished with each remote control switch and must always be used, as the operating coils of the switch are not designed to carry the exciting current continuously. It is therefore necessary that the push button switch must be of the momentary contact type. With this scheme of operation and control, the solenoids are energized only at the instant of closing or opening and the switch is held in the closed position mechanically. When tripped it opens by gravity. The switches are also arranged with a handle so they may be manually opened or closed. They are furnished in sizes up to 300 amperes in single, double or triple-pole, for direct or alternating current and for voltages up to and including 250 volts.

Any number of control switches may be used. They are wired in parallel as shown in Fig. 1, which shows the connections of a double-pole switch controlling a vacuum cleaner equipped with a single-phase motor. The cleaner may be started or stopped from any of the three floors. These switches may also be used on other circuits by providing switches of the proper number of poles and with operating coils suited to the voltage.

It should be noted that this type of switch does not give under-voltage protection since it is mechanically held and will remain in the closed position even though the energy is removed from the line. Therefore, in case the motor is shut down, due to the energy having been removed from the line, it will again start automatically when the voltage is again up to proper value. On this account there are some installations in which this type of remote control switch may not be desirable. For further information on this subject our readers are referred to this department in the Journal of Electricity for November 1st.




Connections for typical class (a) double-pole remote control switch with three control stations. Complete control from any station.

Switches of the (b) class are known as magnetically operated switches or contractors. By reason of their construction, they are also sometimes called clapper type switches. These switches have a single operating coil which serves not only to close the switch but also to hold it in a closed position; that is, the switch is magnetically held. The operating or solenoid circuit is closed as long as the switch is closed.

Due to the fact that the operating coil is continuously excited, this type of switch for alternating current circuits is likely to be noisy unless carefully designed and adjusted. This point must be taken into consideration when installing switches where the noise would be objectionable.

For operating this type of switch only two wires need be carried to the points of control. Any standard make of single-pole switch whether of the snap,

push or knife type will be suitable. Where more than one station is required, the various switches would be wired in parallel. This scheme will permit opening or clasing the remote control switch from any station but will not permit closing from one station and opening from another. If this method of control is necessary, it can be secured by using two three-point switches when two points of control are wanted, or by using a four-point switch in addition to the two three-point switches for each additional control point that is desired. That is, complete control from four points will require two three-point and two four-point control switches and so on.

Like the class (a) switch just described, this form of switch will not give under-voltage protection. Since the operating coil is excited while the switch is in the closed position, the switch will return to the off position in case of reduction or failure of voltage but will again close upon return of voltage. By providing a set of contacts on the remote control switch for the control circuit, these switches can be arranged to give under-voltage protection which is necessary in connection with certain classes of motor installations. To secure this protection it is necessary to run three wires between the switch and various points of control and to provide special push button switches each having a starting and stopping button at each point of control. This scheme permits the switch to be opened or closed from any station, but in case it opens due to failure or reduction in voltage, it will remain in the open position until again closed by pushing in the starting button at one of the control stations. One of the standard lines of double-pole switches or contactors are regularly equipped with these extra contacts on the switch and may be wired for either two- or three-wire control as just described. This form of switch is used extensively with alternating current motors of those types and sizes that may be started by being thrown directly across the line at full voltage.

Switches of the class (c) type are similar in design to shunt-trip circuit breakers, or are modified designs of standard knife switches equipped with suitable spring release actuated by a trip coil. They have only one operating coil which is for the purpose of tripping the switch, usually in emergency, from some distant point. The coil is in the circuit only at the instant of tripping, since these switches are designed to be manually closed and mechanically held. Two control wires are required between switch and each control station. Single-pole switches are suitable and when more than one station is needed all control stations are wired in parallel. This permits tripping the switch from any point. These switches do not give under-voltage protection and cannot be arranged to do so.

Switches of this type are required in some cities in certain classes of public buildings to permit the fire department, in case of emergency, to completely disconnect the electric service without entering the building, from suitable push button stations placed in the principal entrances to the building. Both the class (b) and (c) switches are regularly made in almost any capacity required.

Unless the distance from the switch to the various control points is so great as to cause a decided drop in voltage, No. 14 wire, as specified by the National Electric Code, may be used for any of the types of switches here described. They will generally operate on voltages as low as 80 per cent of normal. Where special long runs between stations are required, the question of wire sizes for the control circuits should be taken up with the manufacturer.

There is an increasing demand for apparatus of this class and it will pay the dealer and contractor to become familiar with the various types and their application. The points covered in this article are those which are most frequently brought up when these schemes of control are being considered.

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## INSTALLATION OF TIME CLOCKS

Time clocks, like many other electrical control devices have been greatly improved during recent years, and when properly installed and cared for are now quite dependable. Most of them have eight day works and other than regular re-winding and an occasional re-setting required on account of the change in lighting hours for the various seasons of the year, need very little attention. However, when placed in unfavorable positions and carelessly handled they usually become a source of much trouble—in fact, a nuisance.

To avoid the most common cause of trouble, time clocks must be set so they will not be subject to excessive vibrations or heavy jars, moisture or wide changes in temperature. This means they should not be placed near doors which are frequently opened or closed or near elevators or in the same room with steam heating or hot water plants. The position should likewise be such that they are conveniently accessible for re-winding or adjusting. Plenty of light, either natural or artificial, should be available when needed in handling the clock. The door should be kept tightly closed to eliminate dust. The clock should also be kept sufficiently far away from the cut-outs and switches so there is no danger of the door coming in contact with them when it is open.

Oil should be applied sparingly and then should be of a good grade of light mineral oil such as would be suitable for any kind of clocks. Oil that is used for general machinery is not satisfactory and will quickly clog up the mechanism.

These seem like very minor faults, but it is indeed surprising to note how many faults which develop in time clocks are due to just such causes. Especially is this true of vibration or excessive jars because these, as a possible cause of trouble, are so often entirely forgotten.

# WHAT WESTERN INVENTORS ARE DOING

BY WM. K. WHITE AND H. G. PROST

*(How should you go about it to apply for a patent? Do you have to submit a working model? How does the government determine whether your invention is patentable or not? How long must you wait before action is taken? Such important questions as these are considered in this article by two prominent patent attorneys of San Francisco, members of the firm of White and Prost.—The Editor.)*

### Combination Claim

A claim, specifying a number of elements combined together in a combination, is frequently termed a "combination claim." The law presumes each of the elements, so specified in a combination claim, to be old. The inventive act, in creating the novel combination so claimed, consists in bringing together, in cooperative relation, the various elements specified in the claim. The invention, covered by a combination claim, is the combination considered as an unity distinct from the elements composing it. Such a combination may be novel notwithstanding each of the elements thereof is old.

A poet is entitled to copyright his poem notwithstanding it is merely a novel combination of words each of which is old and may be found in the dictionary. The poet's creative work consists in bringing together, in a new relation, a number of old words. The combination of words, constituting a poem, is considered as an unity distinct from the words of which it is composed.

There is a close analogy between the creative work of the poet and the creative work of the inventor. The poet may express his ideas in new combinations of old words. The inventor may express his ideas in new combinations of old mechanical elements. In the one case, it is the new combination of words of which a monopoly is granted by the copyright. In the other case, it is the new combination of mechanical elements of which a monopoly is granted by the patent.

A copyright on a poem does not grant a monopoly of the various words thereof, separately considered apart from the combination thereof constituting the poem. A patent on a novel combination of mechanical elements does not grant a monopoly of the various elements thereof, separately considered apart from the combination thereof constituting the invention.

### Patent Application

The first step taken to obtain a patent is the filing of an application therefor in the United States Patent Office at Washington, D. C. The government fee for filing an application is $15.00.

The application for a patent on an invention, capable of embodiment in a machine, comprises a document containing:

**1st. The inventor's formal petition for the grant of a patent.**

**2nd. Drawings illustrating one form of machine in which the invention may be embodied.**

**3rd. A specification constituting a description of the machine shown in the drawings.**

**4th. Claims.**

**5th. The inventor's oath as to being the inventor.**

### Skill Required in Writing Application

The Supreme Court of the United States, in the case of Topliff v. Topliff, 145 U. S., 169, said:

**"The specification and claims of a patent, particularly if the invention be at all complicated, constitute one of the most difficult legal instruments to draw with accuracy, and in view of the fact that valuable inventions are often placed in the hands of inexperienced persons to prepare such specifications and claims, it is no matter of surprise that the latter frequently fail to describe with requisite certainty the exact invention of the patentee, and err either in claiming that which the patentee had not in fact invented, or in omitting some element which was a valuable or essential part of his actual invention."**

### Patent Office Advice Regarding Patent Attorneys

Patent Office Rule 17 reads as follows:

**"An applicant or an assignee of the entire interest may prosecute his own case, but he is advised, unless familiar with such matters, to employ a competent patent attorney, as the value of patents depends largely upon the skillful preparation of the specification and claims. The office can not aid in the selection of an attorney. . . ."**

### Model

No model of a machine is required to be filed with the application for a patent thereon. Furthermore, it is not necessary to make a machine or any model thereof, before applying for a patent thereon.

However, the making, use or sale of a machine for a period of less than two years before the filing of an application for a patent thereon is no bar to the grant of a patent thereon. It is, nevertheless, advisable for an inventor to file his application as soon as possible after the perfection of his invention.

### Prosecution of Application

If the application, as filed, be allowed without objection, a patent issues thereon. Such a patent contains an exact copy of the drawings, specification and claims forming a part of the application as filed.

As a general rule, applications are not allowed as filed.

Upon the receipt of the application by the Patent Office it is dated and given a serial number. A notice of such date and serial number is immediately sent to the applicant's attorney. The application is then sent to the classification department, where it is briefly examined to determine the art to which the invention relates, and from there it is sent to the proper examining division. There are forty-three examining divisions, in charge of each of which there is an examiner and his assistant examiners. In 1916, there were three hundred and thirty-four assistant examiners actively engaged in considering applications.

In each examining division, the applications are examined in the order of their respective filing dates. By reason of the examiners being insufficient in number to promptly consider each application, an application is not acted on, as a general rule, until about four months after the filing of the same in the Patent Of-

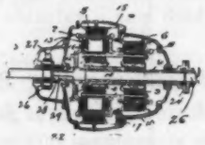
fice. In many instances, the first action on the application is delayed for a much longer period.

Such a delay, in the first consideration of his application, often works a great hardship on the inventor because, until said first action, he is left in the dark as to the attitude of the Patent Office toward his application. To remedy delays of this kind, it will be necessary for Congress to increase the Patent Office examining corps.

## RECENT PATENTS

### Electromagnetic Power Transmission Apparatus

Much interest has been evidenced of late in electromagnetic variable speed power transmission mechanisms for automobiles and turbine driven ships. United States letters patent No. 1,242,714, issued to Alfons H. Neuland of San Francisco, discloses one form of mechanism of this nature which meets the requirements of automobile and ship drives.

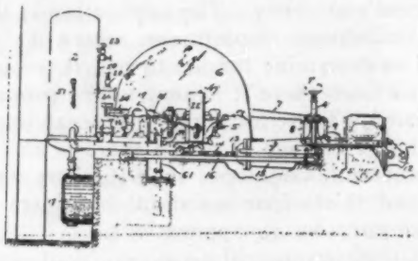


This mechanism consists generally of two axially alined stators having interconnected windings and two rotors mounted on a shaft and arranged within the stators, the rotor windings being also interconnected, and arranged between one rotor and stator is a rotatable field structure. Rotating with the field structure and electrically connected to the field coils is a commutator and the commutator brushes are connected to the other stator.

The field is excited from a source of direct current and the field structure is connected to the engine or turbine, the rotor shaft being the driven element. When the field is energized and the structure rotated, polyphase currents will be generated in the associated stator and rotor windings. The polyphase currents generated in the rotor pass into the other rotor and produce a revolving field therein and similarly a revolving field is produced in the other stator, the two fields having equal angular velocities, and being displaced from each other so that each field exerts a torque on the other. The direction and magnitude of the torque is variable by displacing the stator poles with respect to the rotor poles. This torque, in either direction, is maintained by the stator at all speeds of the rotor. The speed of the rotor may be varied with relation to the speed of the field structure from zero to near synchronism without the dissipation of energy in external resistances.

### Pressure Regulating Apparatus

A new form of governor for water wheels is shown in Patent No. 1,243,073, issued to L. M. Karnasch, of San Francisco, and assigned to the Pelton Water Wheel Co. This

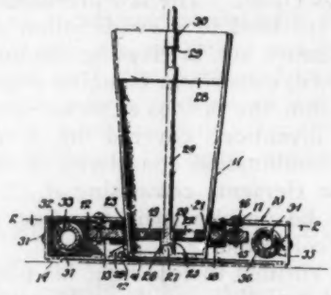


governor operates to vary the position of the needle valve in the nozzle, so that the speed of the water wheel is maintained constant under varying loads on the direct connected generator.

Oil under pressure is the actuating medium for moving the needle valve and it is essential that a supply of oil under constant pressure be maintained so that the needle will respond to the governor with constant sensitiveness. A small water wheel is used to drive the oil pump and the oil is forced into a closed receiver, so that the pressure on the oil varies with the height of the oil. A float in the receiver is operably connected with the needle nozzle of the small water wheel so that as the level of the oil in the receiver tends to fall, the small water wheel and consequently the oil pump is speeded up.

### Electrical Drink Mixer

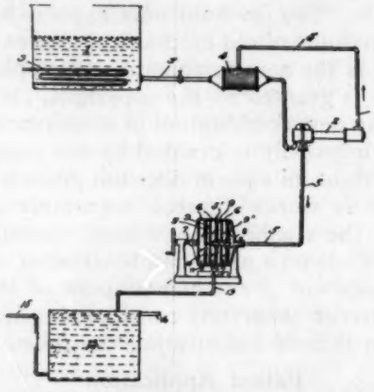
It seems fitting that a man from Bountiful, Utah, should have invented a drink mixer. Patent No. 1,242,493, issued to Richard H. Stringham, shows a novel electrical drink mixer in which the glass is surrounded by a stator in which a



revolving field is produced. The rotor, which consists of a mixing impeller, is placed within the glass in the plane of the stator and the rotating field produces rotation of the impeller and the drink is mixed. Whether the flux in passing through the drink will increase the charge in or for it is not apparent.

### Method for Separating Mixtures of Liquids

Patent No. 1,242,784 has been issued to Ernest L. Dyer, of Oakland, and Arthur R. Heise, of Avila, on a process of separating water from emulsified mineral oils.



In this process the emulsion is passed through a capillary medium under pressure so that the film of oil surrounding the water globule is broken down and the water liberated.

### Other Electrical Patents

Other patents of interest include 1,243,043, issued to Alfred H. Cohen, of Oakland, on an apparatus for producing oscillating currents of high frequency, the novel feature of which appears to be the circulation of liquid under pressure between the electrodes at which the spark is formed.

Patent No. 1, 243, 429, issued to Ferdinand W. Krogh, of San Francisco, discloses a thrust bearing for a vertical shaft and possesses several novel features.

### Decision

In a suit brought by the General Electric Company against Electric Controller and Manufacturing Company on claim 7 of the Carichoff patent No. 763,658 for a controller for electric motors, the Court held the claim to be valid and infringed.

# SPARKS—Current Facts, Figures and Fancy

*(A new device for the convenience of the wounded in the hospital wireless telephone, the saving of gasoline by the use of electric vehicles in England, electrically increasing the egg supply—the demands of war are leading to improved methods and greater efficiency everywhere. And the answer to both needs is electricity.—The Editor.)*

Sixty-seven street railway companies in twenty-one states have been allowed fare increases in some form since 1914, according to the committee on public utility rates of the National Association of Railroad Commissioners.

* * *

By burning two 50 watt lamps in his hen coop, from 5 to 7 in the morning and from 4 to 6 p. m., during the winter, one farmer has persuaded his hens that it was summertime and has increased the production of eggs about two and a half times.

* * *

In view of the plea for standardization in electrical manufactured goods, it is interesting to note that the high cost of shoes in both France and England has caused those governments to adopt a uniform type of foot wear designed for the civilian population.

* * *

The labor market is feeling the influence of the low immigration due to the war. Fewer foreigners entered the country in the year ending June, 1917, than in any year since the beginning of the war—not more than one-fourth the number admitted in 1914, in fact.

* * *

Despite the war, Switzerland still continues to manufacture electric motors and dynamos in the usual number, but as copper is scarce aluminum is employed as far as possible. Motors built of aluminum are of larger size, but lighter and cheaper. Sometimes they are built up to 800 horsepower.

* * *

A new standard of prosperity for public utility owners is to be found in the statement of the Treasury Department that the average citizen of the United States has today, or should have, if he has his share, $45.50 in his inside pocket. This is six dollars more than the average at the same time a year ago.

* * *

Canton, it appears, is about to exchange her walls for an electric tramcar system. Her wall is six miles in length and contains, it is computed, 421,000 square yards of bricks, 450,000 square yards of stone, and 1,000,000 cubic yards of earth. What is more, the removal of the wall means the removal also of some 5000 houses.

* * *

The practice of selling telephone numbers, although apparently good form in Japan, is not to be countenanced in America. Some unsuspecting subscribers in San Antonio, Texas, who paid as high as $15 for well-known numbers, are out their money because those who sold them have left town and the telephone company refuses to recognize the transaction.

When the war is over Germany will again become our competitor in electrical fields. It is interesting, therefore, to note the steady rise of wages in industrial fields in that country. The Bremer Burzer Zeitung gives comparative wage schedules from 1914 to 1916, showing a rise of 65 per cent in the electrical industries for men, 75 per cent for women.

* * *

The high price of gasoline (it is now costing more than $1 per imperial gallon) and the multiplying of electrical supply stations are said to be creating a new demand for electric vehicles for both pleasure and commercial purposes in the United Kngdom. There are now 1,000 commercial electrics in use in England against one-sixth that number before the war.

* * *

Even a deaf and dumb man can answer the ring of an electric bell. One such unfortunate left alone in the house to answer the doorbell kept a little stick resting against the electric bell, which fell to the floor when the bell rang. His little dog, who was kept near the door, was trained to pick up the stick and carry it to his master, who thereupon answered the door.

* * *

A new wireless telephone, invented by a Los Angeles man, is to form part of the equipment of one of the base hospitals in France. With the use of the invention it will be possible to furnish music to the individual patient in a hospital while the sufferer in a cot near by will hear no sound. Nurses also will be able to read newspapers and stories with the use of the apparatus to several hundred patients at the same time.

* * *

According to the University of California Agricultural Department, by wearing your woolen suit longer, you permit more mutton to be marketed, there is less demand for other meats and for the cereals to feed them, and so the cost of bread is kept down and the supply of wheat increased. Any failure to cut down waste in your business starts a ripple that spreads farther than you can see—and may come back to you indeed, in increased grocery bills and a longer war.

* * *

The electrical industry, with every other, has suffered to some extent from the freight congestion. In the face of tremendous difficulties, however, the railroads have handled the situation surprisingly well. Freight statistics for July, the latest month for which official figures are available, show that the railroads successfully handled 20.2 per cent more freight that month than for the same period last year. This great increase in service was rendered with an almost negligible increase in the amount of equipment used.

# PERSONALS

**Lieutenant Colonel Richard Park,** widely known as "Captain" Park—for as such he rendered wide and far-reaching service in first organizing the engineer regiments in the West, is receiving congratulations on all sides for his much deserved promotions, first to Major and now recently to Lieutenant Colonel. "Somewhere in the West" is the only way his location can be published not only because of censorship rules but also due to the intense activity of this leader in organization. From all quarters of the West this news of his promotion will as a consequence be received with unusual interest.

**C. G. A. Baker,** of Baker-Joslyn Co., is making an extended Eastern trip and will probably return the middle of January.

**J. H. Lockett** has been appointed master mechanic of electric lines of the Southern Pacific Company at Oakland, Alameda and Berkeley, Cal.

**Miss C. C. Tessier** has received appointment as Assistant Secretary and Treasurer of the American Public Utilities Company, Salt Lake City, Utah.

**Roland G. Marx,** an electrical engineer, Palo Alto, Cal., has been transferred to the grade of member in the American Institute of Electrical Engineers.

**J. L. Yardley,** general engineer of the Westinghouse Electric & Manufacturing Company at East Pittsburg, is making a tour of Pacific Coast cities.

**J. M. Bradner,** formerly with the San Francisco office of the General Electric Company, has received a commission as captain in the United States Reserves.

**O. M. Hartshorn,** formerly secretary of the Pueblo Gas & Fuel Company, Pueblo, Colo., is now secretary of the City Light & Water Company, Amarillo, Texas.

**E. R. Waite,** who was in the general bookkeeping department of the Denver Gas & Electric Light Company, is to be secretary of the Pueblo (Col.) Gas & Fuel Company.

**Lyman P. Hammond** of Bonbright & Company has been elected a director of the California Railway & Power Company, increasing the directorate to twelve members.

**Romaine Myers,** a consulting electrical engineer of Oakland, California, has returned to his offices after an extended tour of hydroelectric investigation in the high Sierras.

**Gerard B. Rosenblat,** head of the mining section of the Westinghouse Electric & Manufacturing Company with headquarters at Salt Lake City, is a San Francisco visitor.

**Leonard F. Fuller,** chief electrical engineer of the Federal Telegraph Co., San Francisco, has been recommended for transfer to the grade of member in the American Institute of Electrical Engineers.

**C. A. Palmer,** formerly with the Public Service Corporation of New Jersey, has joined the sales force of the railway department of the Westinghouse Electric & Manufacturing Company in San Francisco.

**E. C. Gribble,** who was chief electrician with the Palace Hotel Company of San Francisco for over twenty years, recently resigned to join with W. A. Gribble, his brother, in the Electrical Specialty Co. of San Francisco.

**Major John Coffee Hays,** formerly president of the Mount Whitney Power & Electric Company in the San Joaquin valley, California, is in charge of the newly created utilities department at Camp Lewis, Washington.

**W. L. McKinley,** commercial agent of the Sierra and San Francisco Power Co., after an absence of several weeks in Georgia where he went to settle up an estate recently left to him, has returned again to his duties in San Francisco.

**J. H. Moseley,** advertising manager of the Texas Utility Company and formerly associated with the advertising department of the Journal of Electricity, is now first lieutenant at the second officers' training camp at the Presidio in San Francisco.

**R. E. Frickey** has resigned as electrical engineer for Northern California Power Co., effective Nov. 1, 1917, but has made no definite announcement of his plans for the future. **L. H. Kistler** succeeds Mr. Frickey as electrical engineer for the Northern California Power Co.

**Waldo C. Cole,** of the Westinghouse Electric & Manufacturing Company at San Francisco, will hereafter dovote the major portion of his time to industrial investigations for the company. **H. C. Hopkins** of East Pittsburgh will assume Mr. Cole's former activities with the company.

**Simon Bamberger,** Governor of Utah,, who has done so much for the upbuilding of the electrical industry in that state, attended the recent gathering in San Diego for the formation of a League of Southwestern states and returning up the coast, spent several days in San Francisco.

**G. Porter,** chief engineer of the British Columbia Electric Railway Company, has severed his connection with that company and is entering business for himself. Mr. George Kidd, on behalf of the officials, presented Mr. Porter with a very handsome gilt French clock and wished him every success in his new venture.

**H. M. Byllesby** and **Samuel Kahn** were re-elected president and vice-president, respectively, at the annual meeting of the Western States Gas & Electric Company. **Allen L. Chickering** was re-elected secretary and general counsel. **F. G. Gordon, Elmer Dover, O. E. Osthoff,** and **J. J. O'Brien** were re-elected on the directorate.

**H. J. Kammerer,** chief electrician of the California and H waiian refinery at Crockett, Cal., has tendered his resignation to the company with which he has been connected for so many years. It will take effect on January 1, 1918, and it is announced that he will depart shortly after that date for Hawaii where he will make his future home.

**Roy B. Woolley,** formerly sales and advertising manager, Standard Electric Stove Company, Toledo, and late of the American Ambulance Field Service at the Verdun front in France, having served his enlistment, has returned to America. He is now with The Society for Electrical Development, New York, as an executive in its advertising department.

**John G. Galloway,** a noted consulting engineer of San Francisco, has been called into active service as a major in the United States Engineer Corps. Mr. Galloway is now in the East and it is anticipated that he will see early service in France. As an engineer on the Pacific Coast, Mr. Galloway has long been active. Among other notable achievements he was the consulting engineer for the building of the famous Carquinez Crossing of power lines for the Pacific Gas & Electric Company near Benicia, California, which, though constructed ten years ago, is still the longest single span of wire in the world. In recent months, Mr. Galloway has been an active figure in organizing

local military and defensive effort. As chairman of the committee on inventions for the State Council of Defense, he has rendered able and effective service to the government. His many friends throughout the West wish him godspeed in his active service for the cause of democracy.

**George A. Schneider,** formerly power apparatus specialist at the San Francisco office of the Western Electric Company, has left for the East to assume charge of the Buffalo office of the company. Mr. Schneider's promotion comes in recognition of valuable services rendered not only to the company he has served so faithfully but to the electrical industry as a whole. His series of articles contributed to the columns of the Journal of Electricity during the past year under the heading of "Suggestions for Electrical Contractor and Dealer" has been widely read by men of the industry and the discussions and interest that followed have been of high order. Men of the West will miss his helpful presence, but his going will be still another factor in helping to spread the gospel of co-operation among electrical contractors and dealers in Eastern centers now so widespread in the West.

**P. T. Curtin,** chief electrician at the plant of the Great Western Electro-Chemical Company at Martinez, Cal., left recently for San Francisco, where he will endeavor to regain his health. He has been closely confined with his labors for the past few months and fears that he is near the point of nervous collapse. He expects to be absent a month or six weeks.

**Louis D. Eckard,** who for some months has been engaged as superintendent of construction of a copper mine in Alaska, has recently been appointed assistant general manager of the Alaskan Light, Heat & Power Company, with offices at Seattle. Mr. Eckard before going to Alaska was connected with the Philadelphia Electric Company in the distribution and station construction department.

**H. S. Haley,** member of the firm of Leland and Haley, consulting mechanical and electrical engineers, San Francisco, Cal., is at present at the Llewellyn Iron Works, Los Angeles, in the interest of the U. S. Shipping Board Emergency Fleet Corporation, on one of the largest marine engine and boiler contracts placed on the Pacific Coast. Mr. Haley still retains his interest in the firm of Leland and Haley.

**Lesslie R. Coffin** of Bellingham, Wash., manager of the Whatcom County Division of the Puget Sound Traction, Light & Power Company since 1910, has been ordered to report for duty at the American International Shipbuilding office in Philadelphia of which Charles A. Stone, president of Stone & Webster is also the head. This company is engaged in constructing $300,000,000 worth of ships under government supervision for war trade.

**John L. Harper,** chief engineer of the Hydraulic Power Company and the Cliff Electrical Distribution Company of Niagara Falls, N. Y., is a recent Portland visitor. Mr. Harper has visited or will visit on his trip nearly all of the important hydraulic power plants in the United States, and is making a thorough inspection of all he visits. While in Portland he carefully went over the plants of the Northwestern Electric Company and the Portland Railway, Light & Power Company.

**Major J. B. Allison,** U. S. A.; **Lieutenant Colonel Clark,** U. S. A., and **Major A. H. Griswold,** U. S. R., were the complimented guests at a dinner given by officials of the company at the St. Francis Hotel, San Francisco, on the evening of October 18, prior to the meeting of the Telephone Society of the Pacific Telephone & Telegraph Company. Those present, in addition to the above officers, were: G. E. McFarland, J. C. Nowell, H. D. Pillsbury, J. P. Downs, P. H. Coolidge, F. C. Phelps, C. W. Burkett, B. C. Carroll and Major D. P. Fullerton.

**Chas. H. Delany,** steam power plant specialist of the Pacific Gas & Electric Company, has left for New York City where he will represent the San Francisco Section of the American Society of Mechanical Engineers at the annual meeting in New York. At the hearing of the Power Test Standardization Committee immediately following the annual gathering Mr. Delany, at the invitation of the committee, has consented to present a paper on Standardization of Boiler Tests for Fuel Oil Practice, under the joint authorship of himself and Robert Sibley, editor of the Journal of Electricity.

**Andrew M. Buck,** power house operator for the Surf Inlet Power Co. of Surf Inlet, B. C.; **Edwin S. Healy,** resident engineer of the Pacific Power & Light Co. of Portland, Ore.; **Kenichi Kubo,** assistant engineer of the Inawashiro Hydro Electric Power Co., Tokyo, Japan; **Arno A. Rohde,** electrical engineer for the Lehigh Portland Cement Co., Metaline Falls, Wash.; **Jay L. Standard,** consulting civil engineer, Portland, Ore.; **A. L. Strickland,** city electrician, Ashland, Ore.; and **Bertram Wood,** electrical engineer, Electrolytic Zinc Co., Hobart, Tasmania, have been elected associate members of the American Institute of Electrical Engineers.

**Charles B. Hopkins** has recently been appointed postmaster of Spokane. Men of the industry will be interested in the following item which appeared in the Spokesman-Review on October 19 under heading "Twenty Years Ago Today": "Charles B. Hopkins was appointed postmaster at Spokane to succeed H. T. Mallon. The selection of Mr. Hopkins for the position is no surprise to the residents of Spokane, as it has been generally understood ever since the election that he was to be named for the position. Mr. Hopkins is manager of the Inland Telephone and Telegraph Company and is now at Heppner, Ore., on business for the company."

**S. F. Forbes,** former manager of the Los Angeles office of Fairbanks, Morse & Co., was, on October 1st, made the Pacific Coast Manager for the company, having jurisdiction over the San Francisco, Portland, Seattle, Spokane and Los Angeles offices. The territory covered by these offices includes all of California, Arizona, Nevada, Oregon, Washington, Alaska, the Hawaiian Islands, northern Idaho and western Montana. Baja California, Sinaloa and Sonora are also covered from the Los Angeles office. Mr. Forbes came to Los Angeles from the east, January 1, 1915, as local manager. Since that time he has become closely affiliated with the business interests of the city, and of the southwest. As a director of the Chamber of Mines and Oil, he has contributed valuable suggestions and service to the mining and oil industries. Mr. Forbes expects to make Los Angeles his headquarters. His successor as local manager has not yet been named.

## OBITUARY

E. L. Clyne, superintendent of construction of the Denver Gas & Electric Light Company, died at his home in that city on September 16. He was 55 years of age.

John M. Winslow, one of the pioneer telephone builders of the State of Washington, recently died at his country home near Silver Lake, at the age of sixty-one years. Mr. Winslow was born in Philadelphia. As a civil engineer he was engaged for a number of years in Mexico. Going to the Pacific Northwest, he settled in Tacoma, and fifteen years ago he went to Seattle to reside. He held the position of secretary-treasurer of the Puget Sound Telephone Company and was active in the company's affairs up to the time of his death.

# MEETING NOTICES FOR ELECTRICAL MEN

*(History has been made by men of the electrical industry of the West during the past semi-monthly period. Never before has such a unanimous spirit of willingness to put the shoulder to the helm existed among all branches of the industry. Most important among the meetings that have taken place are those of the San Francisco Electrical Development and Jovian League as set forth in the following lines. Other interesting items on meetings follow.—The Editor.)*

### Joint Meeting of the Portland Sections of the A. I. E. E and N. E. L. A.

The first meeting of the season was held at the Multnomah Hotel Portland, Tuesday evening, November 6, 1917.

Sergeant-Major Kenning, of the British Recruiting Mission, was to have given a talk on his personal experiences in the trenches, but was unable to appear. His place on the program was taken by Capt. Palmer of the U. S. Army, who gave a brief outline of the movements of the European armies in the present war. He went into detail and explained several points of military strategy. His talk was very much appreciated by every one present as the Captain thoroughly understood his subject and had the ability to make his explanation very easy for the layman to follow. Mr. C. L. Wernicke presided as chairman. Refreshments were served after the meeting.

During this year, it is going to be the policy of the program committee to make all of the talks of a more popular nature, avoiding strictly technical papers as much as possible unless they are presented in manner and style which will grip the attention of all the members.

Preston S. Millar, general manager of the Electric Testing Laboratories of New York and past president of the Illuminating Engineering Society, addressed the second meeting of the season, that of Nov. 20, 1917. His subject was "Illuminating Aspects of Street Lighting."

### San Francisco Section, A. I. E. E.

The meeting of the San Francisco Section of the A. I. E. E. on Nov. 23rd held ample repayment for those attending, in the address of City Engineer M. M. O'Shaughnessy on the Hetch Hetchy development, illustrated by stereopticon views, showing the progress of the work. His talk outlined the development already accomplished and told of the plans which San Francisco will follow in the ultimate production of over 200,000 horsepower of hydro-electric energy and the transportation to the bay region of 400 million gallons of water per day. Mr. P. J. Ost gave the details of construction of the preliminary work, and the methods of obtaining power for carrying the project to completion.

### The Telephone and Telegraph Society of the Pacific Coast

The Telephone and Telegraph Society of the Pacific Coast met Thursday evening, November 22, 1917, at Elks Club in San Francisco. The speaker was Sergeant J. Mitchell, of the Seventy-second Canadian Infantry — the "Seaforth Highlanders."

Sergeant Mitchell has lately returned from active service with the famous Canadian troops who are making history on the western front. He gave a more intimate picture of the activities of trench fighting and barbarian atrocities than can possibly be obtained from our usual sources of information and exhibited a number of trophies gathered from the battlefields. The program was extremely interesting and entertaining.

### Los Angeles Section, A. I. E. E.

A meeting of the Los Angeles Section of the A. I. E. E. was held on Nov. 13, 191[illegible] at the Angelus Hotel. L. A. Gary, switchboard engineer of the Southern California Telephone Company, gave the address of the evening on the subject "Plan of Organization of the Pacific Telephone and Telegraph Company." The December meeting to be held on Dec. 11th will be in charge of H. H. Cox and will cover the subject "Four Years Operation of the Big Creek System."

### Spokane Section, A. I. E. E.

The December meeting of the Spokane Section of the A. I. E. E. will be held on Dec. 21, 1917 and will be devoted to a discussion of the subject of the Transmission of Electricity, particularly the Corona of Transmission lines. The committee in charge are: C. S. Covey, chairman, H. V. Carpenter, E. L. Blaine, M. W. Birkett and G. H. Hoppin.

### California Electric Railways Association

The California Electric Railways Association recently elected officers for the ensuing year as follows: President, W. Clayton, vice-president and managing director, San Diego Electric Railway Company, San Diego, Cal.; vice-president, Paul Shoup, president Pacific Electric Railway Company, Los Angeles, Cal.; treasurer, the Anglo & London Paris National Bank, San Francisco. W. V. Hill, 58 Sutter street, San Francisco, is manager of the association.

### Los Angeles Jovian Electric League

A talk on "The Darkest Days in History," dealing with conditions in Turkey, was made at the Nov. 7 meeting of the Los Angeles Jovian Electric League by J. P. McNaughton, who has just returned to this country after residing in Turkey for twenty-eight years.

On Nov. 14th Sergeant C. Raynor of the 16th Canadian Scottish Battalion was the speaker of the day. Songs by Miss Jane Waller added greatly to the entertainment.

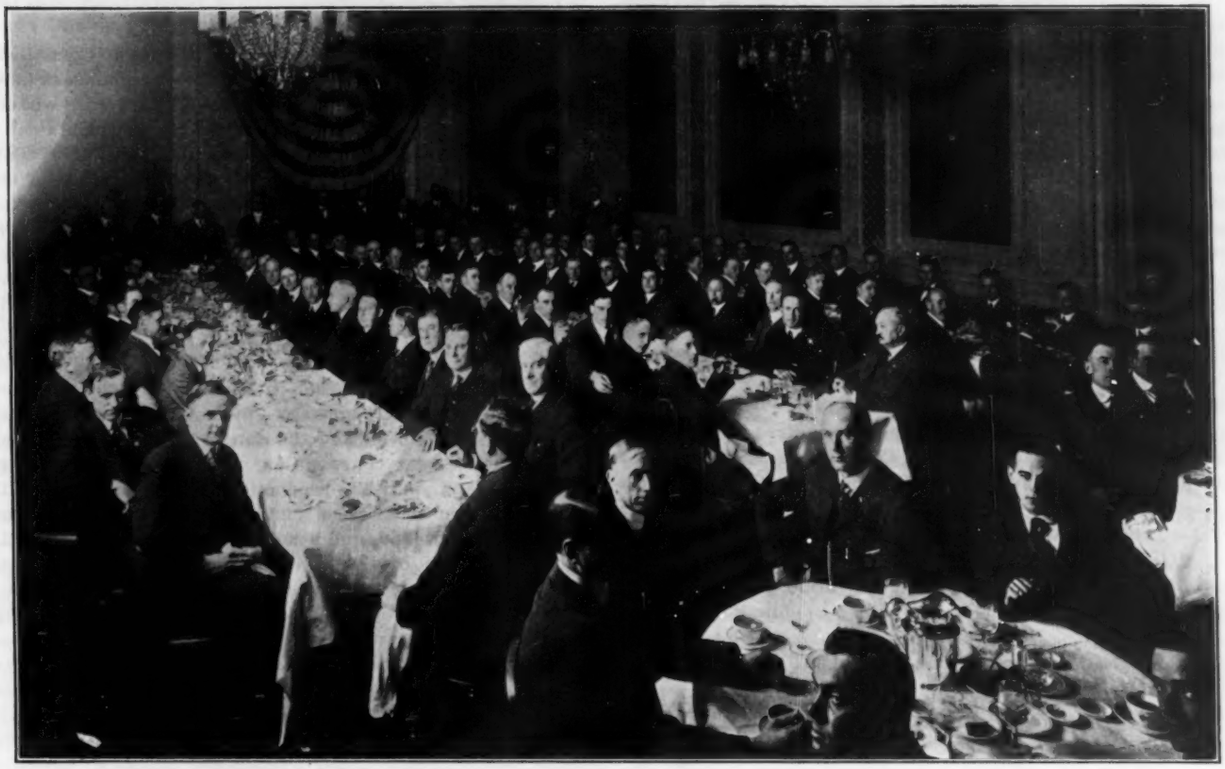
### A League of the Southwestern States

The initial congress of the League of the Southwest was brought together in San Diego on Nov. 14, 1917, to discuss the feasibility of forming a permanent league to further the commercial, educational, artistic and technical interests

## BUILDERS OF THE WEST XVIII

CHARLES WATSON BURKETT

**The close touch with which men of a vast empire are constantly kept with each other due to the excellent conveniences of the telephone has been a factor, inconceivable in its importance, for the development of the great West. To Charles Watson Burkett, chief engineer of the Pacific Telephone & Telegraph Company, this issue of the Journal of Electricity is affectionately dedicated for, like his great chieftains—Alexander Graham Bell and Theodore N. Vail—he has helped to make neighbors of a hundred million people.**



MASS MEETING OF ELECTRICAL MEN AT PALACE HOTEL IN SAN FRANCISCO

Here is one of the most important gatherings of men of the electrical industry in the West during the current year. The San Francisco Electrical Development and Jovian League, acting as hosts for the California Railroad Commission has convened this highly representative gathering to discuss how the best co-operation may be brought about to aid the national government in winning the war. In the audience are men prominent in every branch of the industry. At the speakers' table in the rear, the men standing are (from left to right):

Emerson Hoar, electrical engineer for the Railroad Commission; S. J. Lisberger, engineer of distribution for the Pacific Gas & Electric Company; W. M. Deming, business manager Journal of Electricity; W. W. Briggs, general agent Great Western Power Company; L. H. Newbert, commercial department Pacific Gas & Electric Company; Albert H. Elliot, secretary Pacific Coast Supply Jobbers' Association and chairman of the day; Robert Sibley, Edftor Journal of Electricity and president of the League; Max Thelen, president of the California Railroad Commission and speaker of the day; J. E. Woodbridge, chief engineer Sierra & San Francisco Power Company and chairman engineering committee of Pacific Coast Section N. E. L. A.; Col. H. D. Loveland, California Railroad Commission; Dr. Thomas Addison, western manager General Electric Company; R. M. Alvord, western supply manager General Electric Company; and W. S. Berry, western salesmanager Western Electric Company.

of the southwestern states. Governors of states, mayors of cities and representatives of the allied governments as well as others of prominence were present.

Dr. R. B. von Kleinsmid, president of the University of Arizona, was elected president of the League.

### Oregon Society of Engineers

At a meeting held Nov. 15, 1917 at the Central Library, Portland, A. L. Wilbur, Commissioner of Public Works of Portland, Ore., addressed the Oregon Society of Engineers on the subject of "The need for a complete cost keeping system in City Departments." He contended that real efficiency can only be secured when cost of production is accurately known, and his discussion covered general contract work as well as municipally owned and operated plants as represented by the proposed city paving plant.

### The Pacific Service Employees Association

The Third Annual Show of the Pacific Service Employees Association will be held on December 6th, at the Scottish Rite Auditorium. The show will be of a Christmas and patriotic nature and will be given almost entirely by employees of the Pacific Gas and Electric Company. A chorus of fifty voices will render Christmas carols and an orchestra of twenty pieces will furnish the instrumental music. A Christmas play entitled "Miss Civilization" will be given by members of the association. The Pacific Service Employees Association has a membership of approximately one thousand, the officers being Henry Bostwick, chairman; Geo. B. Furniss, vice-chairman, and R. W. Robinson, secretary.

### A. S. M. E. Annual Meeting

Never was an annual meeting of this society planned which more thoroughly voiced the spirit of the times and more fully interpreted the current problems of the engineer than will the coming annual meeting. Interest will center at once in the opening session on Tuesday evening, December 4, the occasion being the conferring of honorary membership upon Maj.-Gen. George W. Goethals, with an address by Hon. William H. Taft, ex-President of the United States.

The topic which is uppermost in the minds of every one —the war—will constitute the basis for the keynote session which is to take the entire day, Wednesday. The subject is to be broadly interpreted from the standpoint of the service which the engineer can render to his country in times of crisis, whether of war or peace.

The presidential address by Dr. Ira N. Hollis will be given at this session, on Universal Public Service in Peace and War. Other addresses will follow on more specific problems relating to the work of the engineer in agriculture; transportation by rail and road, water and air; education and research. The other sessions will be equally interesting and important.

### San Francisco Electrical Development and Jovian League

At the Nov. 7 meeting of this society, instead of the usual speaker of the day, four speakers gave very brief talks, two on "Co-operation," the third on "How to Play Safe," and the fourth on "What the Inspector Expects." The speakers were C. G. Hardy, city electrician of Oakland; Arthur Kemp-

ston, city electrician of San Francisco; John R. Brownell, superintendent of safety, State Accident Commission, and Robert L. Eltringham, safety engineer, State Accident Commission.

On November 14, the subject of building up friendly engineering and commercial relations with the Orient was undertaken for discussion. G. I. Kinney of the General Electric Company as chairman of the day introduced in turn Mr. Harushara, consul general of Japan, John Clausen, vice-president of the Crocker National Bank and manager of the Foreign Exchange Department, H. R. Hatfield, dean of the College of Commerce and acting president of the University of California, and E. W. Wilson, vice-president of the Anglo London Paris National Bank and vice-president of the Foreign Trade League. After most interesting talks from these gentlemen the resolutions set forth on the front cover of this issue of the Journal of Electricity were unanimously carried.

An exceptionally large attendance graced the meeting of the League with the Railroad Commission as guests, held at the Palace Hotel on Nov. 19. The meeting was opened with a statement by each person present of the work being done by his company to assist the government.

Albert H. Elliot, acting as chairman, spoke of government by commission as a twentieth century method. Progress has brought out problems of especial public interest, and it is to meet these problems that the commissions with their experts have been evolved.

Max Thelen, president of the Railroad Commission, stated that now was an opportune time for engineers of the electrical industry to ask themselves, "What can we do?" An interconnection of the various hydroelectric plants can be made to conserve fuel by a more complete use of available water power. We can eliminate all unnecessary use of electricity and we can develop new sites, but this is a slow process. Something must be done for the margin of reserve power is very little, and a shortage of electrical apparatus is imminent. His suggestion of a committee to make a survey of what can be done was followed by the unanimous passing of the resolution set forth in full on the editorial page.

Emerson Hoar, electrical engineer for the commission, and J. E. Woodbridge of the N. E. L. A. and chief engineer of the Sierra & San Francisco Power Company, emphasized the scarcity of fuel oil and the danger of a serious shortage due to the present consumption of one million barrels per month more than the production. The support of the Railroad Commission in all efforts for advance was promised by Col. Loveland, and a unity of action requested by Dr. Thomas Addison of the General Electric Company, in the matter of supplying the pressing need of electric motors in oil production.

# HAPPENINGS IN THE INDUSTRY

### Changes and Beginnings

The Richland Telephone Company of Richland, Wash., has sold out to the Kennewick Valley Telephone Company.

The San Joaquin Light and Power Corporation's shares are now listed on the San Francisco Stock and Bond Exchange.

The Baker-Joslyn Company has been appointed Pacific Coast Distributors for the V. V. Fittings Company and will carry adequate stocks of the "V. V." line at their three warehouses.

F. A. Bauman & Company of Portland, Oregon, have established their new location at 250 Stark street, near the corner of Third, and will maintain a modern and up-to-date retail electrical store.

The Ward Leonard Electric Company of Mount Vernon, N. Y., manufacturer of electric controlling devices and vitreous enamel insulation resistance units, announces that it is now represented in San Francisco by the Electric Material Company, 589 Howard street.

The Badt-Westburg Electric Company, of Chicago, who handle the Ward Leonard Electric Company's line of electric controlling devices and vitreous enamel insulation resistance units, announces a change in the corporate name to Westburg Engineering Company. This involves no change in the management.

On October 1, 1917, the New York sales office of the Edison Storage Battery Company, long located at 206 W. 76th Street, moved into larger quarters, at 209 West 76th Street, right across the street from the old headquarters. At the new location many additional facilities have been installed to enable the manager, Mr. John Kelly, to take care of the increased business and to give every customer the usual Edison service.

In addition to its district sales offices now located at New York, Boston, Philadelphia, Pittsburgh, Chicago, St. Louis, Denver, San Francisco, Seattle, Dallas, Atlanta, and Detroit, The Youngstown Sheet & Tube Company has opened a branch in the Munsey Building, Washington, D. C. This office will be in charge of Mr. W. B. Blowers, District Sales Agent, assisted by Mr. H. E. Richardson, who has been transferred from the Philadelphia office and who will reside in Washington.

### New Power Loads

During the month the town of Union Gap granted the Pacific Power & Light Company a 50-year franchise. The town of White Salmon has signed a 10-year street lighting contract.

During the week ended November 3rd the Eureka division of Western States Gas & Electric Company secured contract with the California Central Creamery for the power requirements of their new plant at Arcata. The Rolph Ship Yards are being supplied an additional 40 horsepower in motors. The Western States Company is now negotiating with the Arcata Barrel factory for the power requirements of their new factory, estimated at 150 horsepower.

The No. 5 boat of the Natomas Dredging Company of Stockton, California, which is operated electrically through energy supplied by the Western States Gas & Electric Company, has been placed in operation after having been out of commission for six or seven months.

The Union Iron Works is to construct 40 torpedo boat destroyers for the United States Government. The engines for these will be built by the General Electric Company at its plant in Erie, Pa.

The Cokedale coal mines in Skagit county, Wash., are to be opened in the immediate future and the mine is to be electrified, a contract having been let to the Puget Sound Traction Light and Power Company, which will build a power line as soon as materials can be secured. A substation will be built at the mine and 500 h.p. will be developed. The Washington Portland Cement Company let the contracts.

### New Business

A net gain of 345 electrical customers and 16 gas customers is reported in Portland, together with an additional gain in motors of 650½ h.p.

The F. E. Newbery Company of Los Angeles has contracted to do the electrical work for a bank and office building at 725-729 S. Spring street.

The wind-up of the vacuum cleaner campaign of the Pacific Power & Light Company of Portland scheduled for September shows that 132 machines were sold during this campaign. For the ten months of this year 507 cleaners were sold as compared with 200 for the year 1916.

All previous records for new business sales were broken in Denver last month. Complete figures as to the total business done in October are not yet available, but it is evident that the amount will be more than $40,000. Sales for the year will run to $300,000 as against only $50,000 a few years ago.

### Personal Items

Norman B. Hickox has been appointed sales manager of the National X-Ray Reflector Company to succeed Ernest H. Cameron, who has resigned and is now located at Seattle, Wash.

A. C. Cornell, has been house-goods specialist in the St. Louis branch house of the Western Electric Company, has been appointed sales manager of the Denver, Col., branch house of that company.

F. Tresselt, representative of the V.V. Fittings Co., is spending some time on the Pacific Coast with the San Francisco, Los Angeles and Seattle houses of the Baker-Joslyn Co., who are acting as Coast Distributors of the "V. V." line.

C. R. Hunt, of Robbins & Meyers, has returned from a five weeks' visit in the East. Mr. Hunt reports that his company's factory is crowded with orders but that the company is taking care of customers' requirements with remarkable promptness in view of abnormal conditions.

J. D. Holmes, manager at Oakland, is receiving many compliments on the able manner in which he explains the details of "Speeding the Spoken Word," the three-reel motion picture showing an interesting insight into the telephone industry, which is being exhibited before various commercial organizations in the bay cities — Oakland, Alameda, and Berkeley.

H. A. Good, formerly with the San Francisco office of Pacific States Electric Company is now handling outside sales work for the Oakland office of the company. A. A. Elick has charge of the inside work for the Oakland Branch and Geo. G. Drew is sales agent in charge of the Oakland Branch. Mr. Drew reports a nice increase in volume of business right along, on the east side of the bay.

The Philadelphia Storage Battery Company have acquired the services of Walter E. Holland to take charge of research work connected with the manufacture of Philadelphia Diamond Grid Batteries for use in electric pleasure and commercial cars and starting, lighting and ignition systems on gasoline cars. Mr. Holland was for some years Pacific Coast representative of the Walker-Vehicle Company, Chicago, and of the Elwell-Parker Electric Company, Cleveland.

### License for Handling Explosives

Any person in the United States found with explosives in his possession after November 15, who does not have a license issued by the Federal Government showing the purpose for which the explosives are to be used, will be at once arrested and fined up to $5,000 or sent to prison for one year.

The law provides that every one who handles explosives must have a license. The manufacturer, the importer and the exporter must have licenses issued by the Bureau of Mines in Washington. The seller of explosives and the purchaser of explosives must also have licenses, these to be issued generally by county clerks, or other local officers who are authorized to administer oaths. There will be at least one licensing officer in each county, and more agents will be designated if the county is sufficiently large to warrant it.

With the strict enforcement of this law, the Federal authorities hope to prevent explosives falling into the hands of evilly-disposed persons and to put a stop to all further dynamite plots.

All industries requiring explosives should continue until local licenses are issued.

### Amalgamation of Large Heating-Device Interests

For some time past it has been generally known in the West, although confirmation was lacking officially, that a gigantic merger of the heating-device interests was in progress. It is now announced that three of the largest manufacturers of domestic electric heating devices have consolidated their interests into one company to be known as the Edison Electric Appliance Company. This company will be organized to acquire the domestic electric heating-device business of the General Electric Company, the Hotpoint Electric Heating Company and the Hughes Electric Heating Company.

The purpose of this amalgamation is to secure a large volume of production of domestic electric heating devices and also more standardized designs. The new company, it is felt by the organizers, will also be able to secure more complete and thorough distribution of its output than could be done by the individual companies acting separately .

The new company will be licensed under the Marsh patent to use nickel-chromium in its resistance units.

W. H. Booth of the Hotpoint company will be chairman of the boards of the new company, and George Hughes of the Hughes company will be president. A. K. Baylor and H. C. Houck of the General Electric Company will be on the board of directors. Mr. Richardson and Percy Booth, both of the Hotpoint company, will be associated with the manufacturing and commercial departments of the new company respectively. An announcement of the capitalization of the new company will be made at a later date.

For the time being the new company will use the factories of the Hotpoint company at Ontario, California, and the Hughes company at Chicago. The domestic heating-device manufactures of the General Electric Company will be moved from Pittsfield, Mass., to the new factories.

### Car Fare Raise

The Superior Court of Thurston county, Washington, has sustained the action of the Washington State Public Service Commission, in permitting the Puget Sound Traction Light & Power Company to abolish the four-cent fare in Seattle. Corporation Counsel of Seattle has given notice of appeal.

### Preference to Western Coal Shipments

Railroads have been ordered to give priority rights to coal for shipment north and west from the mines of Wyoming and Utah.

Robert S. Lovett, administrative officer under the provisions of the priority shipments act, has issued the following priority order No. 3:

First, That the railroad companies named in subdivision "third" below, serving the coal mines in the Utah and Wyoming coal fields, shall, until further order, supply daily to the mines in the Utah and Wyoming coal fields all or so many of the empty box and single-deck stock cars moving west or northwest over their lines as may be required to transport coal ready for shipment west or northwest, according to the direction in which such cars are being moved.

Second, That the railroad companies named in subdivision "third" below shall so transport or deliver all cars of every kind loaded with commercial coal and destined to points west and northwest of point of shipment, that they shall have preference and priority in shipment, after transporting (a) railroad fuel supply; (b) live stock and perishable freight, including sugar beets; (c) Government shipments; and (d) commodities to and from smelting plants sufficient to keep same in operation.

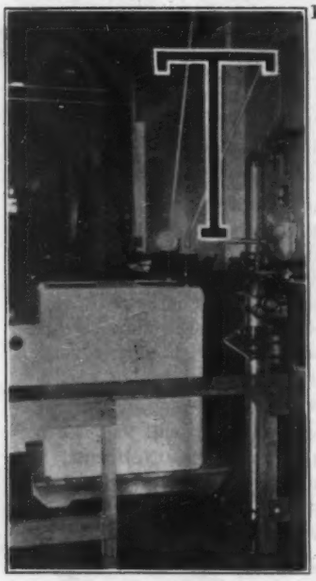
Third. The railroad companies to which this order applies are: Denver & Rio Grande Railroad Co., Los Angeles & Salt Lake Railroad Co., Utah Railway Co., Union Pacific Railroad Co., Oregon Short Line Railroad Co., Southern Pacific Co., Western Pacific Co.

# LATEST IN EVERYTHING ELECTRICAL

*(The startling picture of the head of a living man shown below is an example of effective X-ray work. The difficulty involved and the way in which it is overcome by a new converter is here pointed out by a research engineer of the Rieber Laboratories. A magnetic pulley used in removing iron from other products and a new induction motor panel are further described.—The Editor.)*

## NEW DEVELOPMENT OF X RAY APPARATUS

BY C. B. MERRICK



A test of 120,000 volts

THE use of electricity in the medical field has compelled the physician to become more or less of an electrician, and consequently he is to that extent interested in the makeup of the apparatus he uses. On the other hand the electrician has entered the medical field, and a mutual advantage has been attained.

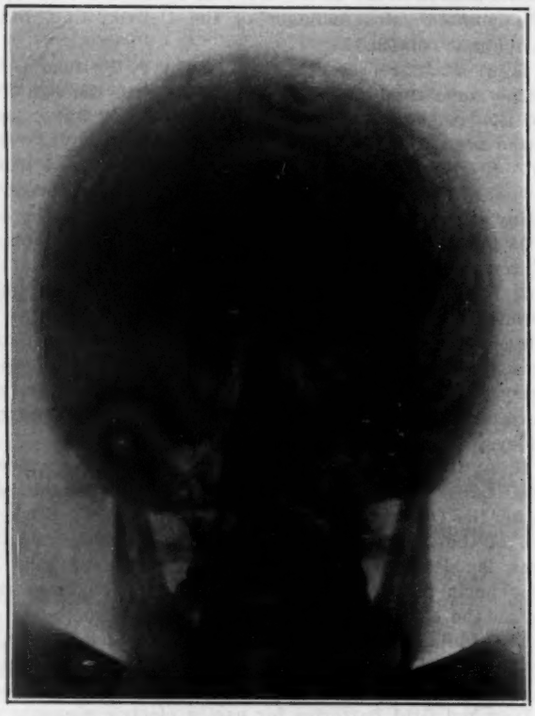
The use of the X-ray machine is now so universal that a statement of the requirements of such a machine may be of interest. The X rays are produced by means of electrical discharges through a vacuum, which necessitates a high electromotive force to produce the discharges. In order to concentrate the rays and prevent injury to the tube this e.m.f. must be undirectional, the generation of which at high potentials presents many difficulties. The method employed has been to transform from ordinary a.c. lighting voltage to the potential required, the input to a high tension transformer being controlled by an auto transformer. The output from the high tension transformer was then rectified by an electrolytic or synchronous air rectifier.

One difficulty of this method is the dead points between contacts on the auto transformer, which prevent variation of applied potential during exposure. A series resistance allows for variation during exposure but is unsatisfactory in many ways. It causes poor regulation, the voltage drop varying with the load, so that a no load adjustment previous to exposure cannot be made except by guess. This is exceedingly difficult, as the resistance of the tube varies from time to time, even during the exposure. Exposure tables are made up for a given value of current and uniform results depend largely on the ability of the operator to maintain the current at the value desired. A radiograph of a head taken with an exposure of 110 milliampere seconds at 75 thousand volts is shown in the cut.

The electrolytic rectifier has a low and variable efficiency on heavy loads, and the synchronous rectifier in air is noisy and generates chlorine gas due to the arc produced.

These difficulties have been overcome in the Rieber Converter by a special auto transformer having no dead points between contacts so the applied voltage can be varied at any time, and the penetration changed even during an exposure. This eliminates the necessity for a common practice of installing a special supply transformer of large capacity exclusively for the use of the converter, and thereby reduces the expense of operation. The high tension secondary has been divided into sections, each section having its individual rectifier. Then by immersing the whole in oil, the size of the parts has been greatly reduced and the noise eliminated. For the general safety of the operator it is necessary to keep the high tension circuits away from the control apparatus. Even the milliammeter which measures directly the current in the tube circuit can be handled with safety.

Consistent dependable service has become a necessity. Assurance of uniform operation under all conditions is obtained by thorough factory tests on each machine before it is put into service. This consists of preliminary tests upon all the constituent parts, and a final complete test upon the assembled unit. The photograph shows a converter undergoing the final test of continuous operation for two hours at 120,000 volts. This allows a wide margin of reserve, as actual operating conditions seldom impose a more severe demand upon the machine than 100,000 volts for a few seconds.



ROENTGENOGRAM OF A SKULL

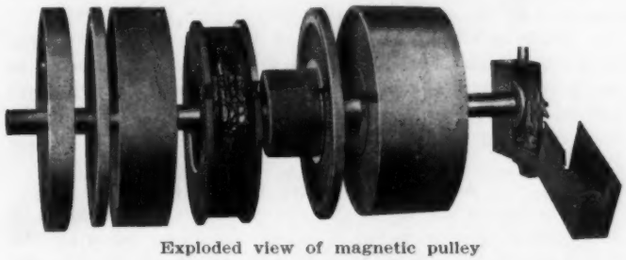
Here is a picture of a man's head taken by means of the improved X-ray apparatus, using a 110 milliampere second exposure at 75,000 volts.

## MAGNETIC PULLEYS USED IN MANY INDUSTRIES

The use of magnetic separator pulleys has increased to a great extent during the past few years. For example, they are used with success in removing pickheads, coupling pins, etc., from coal passing to a crusher which would be damaged by the entrance of such material. They are used for similar purposes at phosphate rock mines and quarries. In the production of sulphite fibre paper stock, they are used to remove tramp iron and steel from the wood chips before these are delivered to the sulphate tanks. They are also used in the production of cement, gypsum, limestone, clay for terra cotta manufacture, as well as in the freeing of grain, spices and tobacco from bits of iron or steel before grinding. They also find employment in city refuse disposal plants, for removing

tin cans, horse shoes, nails, etc., from the worthless material. The high cost of metals has made the saving of metal turnings and separation of iron and steel from brass well worth while.

The magnetizing of the pulley is accomplished by means of passing direct current through windings in the interior of the pulley. The current sets up a magnetic flux which passes through the belt, and attracts any iron or steel contained in the material carried by the belt. As a result these pieces are



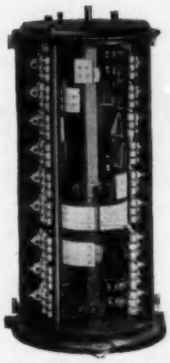
Exploded view of magnetic pulley

held in contact with the belt until the latter leaves the pulley underneath. Here they are dropped and collected in a box or kept separate (by means of a barrier) from the other material which is projected beyond the pulley. The disposal of the materials is cared for according to the amount and kind of product handled.

Direct current is required to energize the magnetic separator pulley when in operation. Only a small amount of current is required, the average for sizes in greatest use being but a few amperes. Standard pulleys can be connected therefore to any 110 or 220-volt direct current electric system, although pulleys may be designed with coils suitable for operation on 500-volt direct current circuits.

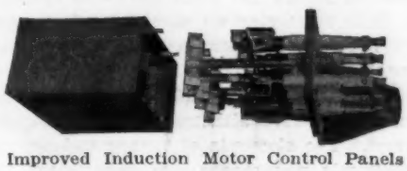
## INDUCTION MOTOR CONTROL PANELS

Where it is desired to combine in one unit the complete control equipment for wound-rotor induction motors, a neat, safe and convenient means either for starting or for speed variation, is provided by Type RF control panels, manufactured by the Westinghouse Electric & Mfg. Company of East Pittsburgh, Pa. By their use motors are provided with complete protection from injury due to overloads, failure of voltage and improper starting. Panels are suited to all applications where drum controllers may be employed. Each outfit consists of a pipe-mounting slate panel on which is mounted an oil circuit-breaker for the primary circuit; a drum controller for the secondary circuit; and when desired one or more meters mounted on the panel. Resistors are separately mounted.



Interior View of Controller

One of the most interesting features of these panels is an interlock between the oil circuit-breaker and the drum



Improved Induction Motor Control Panels

controller which renders it impossible for the operator to start the motor without all the resistance in the secondary.

These panels are recommended for service in which reversing is seldom or never required.

## SPARTAN PORCELAIN CURRENT TAPS

Often it becomes necessary to provide a connection for fan motor, heating pad, or other current-consuming device in a room where there is no convenient receptacle—and where the electric lamp must be retained at its original location.

Current Tap

For just such conditions, the Spartan Porcelain Current Tap was designed. This device, manufactured by the Bryant Electric Company, of Bridgeport, Conn., is virtually a ready-wired socket adapter with a slotted receptacle in its side, for cap or plug. One end of its body is fitted with standard screw plug—just like a regular lamp base—the other end is designed to receive a standard medium base lamp. Thus a lamp may be removed from its socket, the Spartan Tap put in its place, and the lamp screwed into the outer end of the Tap. It therefore not only provides for the retention of the lamp in its original location but provides a suitable approved receptacle for attachment plug.

This device can be furnished for multiple or series connection.

## SUPERIOR COURT SETS ASIDE COMMISSION'S RULING IN RATE CASE

Holding that the public service commission has no jurisdiction over waterworks operated in Dallas by H. V. Gates, the supreme court has handed down an opinion in which the decision of Circuit Judge Kelly is reversed and the order of the commission reducing the rates charged by Gates is set aside. In 1902 the city of Dallas made an agreement with Gates whereby Gates was to build waterworks to cost not less than $20,000 and the city was to pay him $12,000 and furnish all rights of way and water permits. Gates was to operate the plant for 20 years, at the end of which the city was to pay an additional sum to be fixed and take over the plant. The Supreme Court holds that the plant is municipally owned and hence the public service commission has no jurisdiction.

## COMMITTEE ON ELECTRIC STATION SAFETY ORDERS

Announcement is made by John R. Brownell of the California Industrial Accident Commission that the committee to prepare Electric Station Safety Orders is composed of the following:

League of California Municipalities: R. H. Manahan, City Electrician, City of Los Angeles; Arthur Kempston, Chief, Department of Electricity, City of San Francisco. California Electric Railway Association: Walter T. Bivins, Chief Engineer Electrical Equipment, United Railroads of San Francisco; S. H. Anderson, Electrical Superintendent, Pacific Electric Railway, Los Angeles. State Railroad Commission: F. Emerson Hoar, Gas and Electrical Engineer. Pacific States Telephone & Telegraph Co., R. T. Joslin, Engineering Department. The Western Union Telegraph Co., J. C. Fricke. Postal Telegraph Co., H. C. Shaw, Division Electrical Engineer. Manufacturers of Electrical Equipment: John Hood, Engineer, General Electric Co.; R. F. Behan, Westinghouse Electric & Manufacturing Company. National Electric Light Association, Pacific Coast Section: J. A. Lighthipe, Electrical Engineer, Southern California Edison Co., Los Angeles; J. P. Jollyman, Engineer of Electrical Construction, Pacific Gas & Electric Co.; J. A. Koontz, Electrical Engineer, Great Western Power Company; M. C. McKay, General Superintendent, Sierra & San Francisco Power Company. International Brotherhood of Electrical Workers: Pacific District Council No. 1—President J. Morgenthaler, San Francisco; Linemen's Union and Station Operators' Union No. 151—Harry Book, Henry Boyen; Cable Splicers' Union No. 537—President C. A. Elmore, Oakland.

# BOOKS AND BULLETINS FOR ELECTRICAL MEN

### Electrical Apparatus

Choke Coils for Alternating Currents are described in Bulletin No. 45060 of the General Electric Company.

An 8-page bulletin gotten out by the General Electric Company bears the title "RF Adjustable Speed Motors."

Hubbell Quick Catch Sockets are the subject of an eight page pamphlet issued by Harvey Hubbell, Inc., of Bridgeport, Conn.

Bulletin No. 45505, a 12-page booklet issued by the General Electric Company, describes and lists Induction Voltage Regulators.

Portable Instrument Transformers of types P2 and R2 form the subject matter of Bulletin No. 46030 of the General Electric Company.

An attractive 55-page bulletin of Electrical Specialties has been recently given to the trade by the Chelten Electric Company of Philadelphia.

"Motor Driven Exhaust Fan Outfits" are described in a 14-page bulletin (No. 41801) recently given to the trade by the General Electric Company.

The General Electric Company has published its index to Supply Part Bulletins as well as a second which covers Descriptive Bulletins and Sheets.

Bulletin No. 1D of the Crouse-Hinds Company of Syracuse, N. Y., is entitled "Safety Panels and Cabinets" and includes descriptions and price lists.

A change in the Standard length of chain on P&S Pull Sockets and Receptacles is announced by Pass and Seymour. Hereafter the chains on all such sockets are to be 8 inches unless otherwise specified.

The Cutler-Hammer Mfg. Company of Milwaukee, has just published a one hundred page booklet containing reproductions of letters received from motorists giving opinions on the C-H Magnetic Shift. The letters are photographically reproduced and are interesting in that they indicate a well defined liking for pre-selection of speeds as provided by the Magnetic Shift, by the motor car driver.

A 28 page revised bulletin on Type D.O.A. Outdoor Cable Terminals has just been issued by the Standard Underground Cable Co. in which several new types of terminals are described and listed. Among these are the Protected Disconnection Terminal, Pipe-Top Terminal and Borehole Terminal. The bulletin gives tables of working voltages and sizes of conductors for which terminals of certain dimensions and weights are required, also instructions for ordering, installing, etc.

### Coal and Mining Bulletins

A recently published circular lists the publications of the West Virginia Geological Survey, covering such subjects as Coal, Petroleum and Natural Gas.

"Control of Hookworm Infection at the Deep Gold Mines of the Mother Lode, California," by Dr. James G. Cumming and Joseph H. White, is the title of Bulletin 139 of the Bureau of Mines.

"The Effect of Low Temperature Oxidation on the Hydrogen in Coal and the Change in the Weight of Coal on Drying" is the title of Technical Paper 98 of the Bureau of Mines, gotten out by S. H. Katz and H. C. Porter.

The Committee on Coal Conservation of the Chamber of Commerce of the United States has addressed Bulletin No. 2 to the Owners and Managers of Power Plants with suggestions as to how coal may effectively be conserved.

Bulletin 136 from the Bureau of Mines covers the subject of the "Deterioration in the Heating Value of Coal during Storage," being the result of a series of tests conducted under the supervision of Horace C. Porter and F. K. Poitz.

A recent bulletin gotten out by J. K. Clement and J. N. Lawrence under the Bureau of Mines covers the subject of "Laboratory Determination of the Explosibility of Coal Dust and Air Mixtures." It is listed as Technical Paper 141.

The California State Mining Bureau has issued a series of reports on the Mines and Mineral Resources of the various counties of California, the separate booklets representing chapters of the State Mineralogist's report of 1915-1916.

Bulletin 138 of the Bureau of Mines is entitled "Coking of Illinois Coals" and covers the various factors involved in the process and a general discussion of tests which were carried out by the Illinois State Geological Survey and the department of mining engineering of the University of Illinois.

### Annual Reports and Price Lists

The bound volume of the annual report of the Board of Supervising Engineers of Chicago Traction covering the period ended January 31, 1914, has recently been given to the public.

A complete classified list of publications for 1917-1918 has recently been gotten out by J. B. Lippincott Company of Philadelphia.

A classified list of books has been gotten out by Longmans, Green and Co. of New York.

Additions and changes in retail price lists are the subject of a recent pamphlet issued by Boorum and Pease Company of New York City.

### Upbuilding the Electrical Industry

Circular No. 68 of the Bureau of Standards covers the subject of "Public Utility Service Standards of Quality and Safety." The National Electric Safety Code and electrolysis mitigation are two of the subjects covered.

The Underwriters' Laboratories of the National Board of Fire Underwriters have issued an October supplement to the List of Inspected Electrical Appliances.

"The Vital Relation of Insurance to Banking and Shipping in the World's Trade after the War" is the subject of a pamphlet by Henry Evans addressed to bankers, capitalists, shippers and producers.

A circular on Holiday Business with suggested advertisements has been gotten out for the trade by the Hotpoint Electric Heating Company.

In response to the growing demand for information concerning the flood control works to be built by the Miami Conservancy District, Dayton, Ohio, and concerning the results of the investigations conducted by its engineering staff, a series of Technical Reports describing the development of the project and all features and investigations of importance are being printed.

## BOOK REVIEWS

### Practical Electricity

by Terrell Croft, consulting electrical engineer; size 6 x 9 in.; 646 pp.; published by the McGraw-Hill Book Company of New York City and for sale by the Technical Book Shop, San Francisco. Price $2.50.

An excellent textbook for a man of little previous training or a book of review for more advanced students wishing to refresh their memories on electricity is to be found in Mr. Croft's book. No abstruse mathematical formulas or theories are involved; if a man understands arithmetic the subject matter of the text should be clear to him. Formulas and mathematical charts, although simple, however, are technically correct. The elements of theory and practice of electric and magnetic phenomena are here clearly presented. Wherever possible, familiar analogies have been employed. Illustrations are profuse and well explained. The book should be understood by high school students—in its comprehensiveness it might well serve as a textbook for a beginning college course.

# NEW ELECTRICAL DEVELOPMENTS

*(The announcement of a gigantic project to utilize the waters of the upper Kings River for power generation is perhaps the most important news of the week. The power that will be eventually developed, according to present plans of the corporation's engineers, will amount to more than 100,000 horsepower. Plans for a large sawmill are being pushed in Oregon and farm activities along electric lines continue to be reported from the central valleys of California.—The Editor.)*

## THE PACIFIC NORTHWEST

SEATTLE, WASH.—The contract for furnishing transformers to the city lighting department has been awarded to W. R. Hendry & Company, at $55,778.94.

SALEM, ORE.—An application asking for permission to revise rates on electricity has been filed with the public service commission by the Bandon Power Company.

OLYMPIA, WASH.—Bids will be received up to Dec. 1, 1917, for construction of a cottage and power house at the state school for girls at Grand Mound, Washington.

DELTA, B. C.—The municipal council of Delta, B. C., have under consideration the installation of an electric pump in connection with the East Delta dyking and drainage system.

SNOHOMISH, WASH.—An election will be held Dec. 4th at which the people will vote on the installing of two 20 horsepower electrical pumps with a capacity of 11,000 gallons a minute.

NEW WESTMINSTER, B. C.—The city council of New Westminster has closed a contract with the Western Canada Power Company for a supply of power and light at the Poplar Island shipyard.

SKYKOMISH, WASH.—The town council has accepted the bid of the State Board of Finance for the $7,000 bond issue to be used in acquiring and constructing a municipal light and power plant.

EUGENE, ORE.—The Portland office of NePage, McKenny Company has been awarded the contract for the electric wiring in the Medical School of the University of Oregon at this place at $5444

VANCOUVER, B. C.—The contract for electrical work at the Wallace Shipyards Company's foundry on Industrial Island has been awarded to Mundy, Rowland & Company, Standard Building, Vancouver.

SEATTLE, WASH.—Meacham & Babcock have agreed to build the Ballard Extension of the municipal car line for $117,000. Harry Whitey Treat has offered to sell his Loyal Heights line to the city for $70,000.

SHELTON, WASH.—The Shelton Light and Power Company recently applied to the Mason county commissioners for a 25 year franchise to construct and operate transmission lines from their plant on Goldsborough Creek.

PASCO, WASH.—A municipal ownership league has been formed here, with the idea of settling the water system question permanently. It has been proposed to purchase the Pacific Power & Light plant, but they cannot come to terms.

AUBURN, WASH.—The council has under consideration the granting of a franchise to the Valley Gas Company to manufacture and sell electric current for light and power purposes in Auburn. Action has been postponed for two weeks.

SEATTLE, WASH.—John E. Price & Co. will accept delivery of the $390,000 light extension bonds of date of October 1, under an agreement reached by Corporation Counsel Hugh M. Caldwell and Bruce Shorts, Seattle representatives of Caldwell & Masslich of New York.

STAYTON, ORE.—At a recent meeting of the city council a franchise of city property was granted the proposed new railroad. An electric power right was also given for a term of 50 years. It is said the road will be operated by steam for a time, but later will be electrified.

VANCOUVER, WASH.—The Northwestern Electric Company has secured a franchise to endure for 50 years for all the country roads and streets outside incorporated cities and towns in different portions of the county. The company intends to supply current to the farmers in the district and industries near Camas for lights and power.

SEATTLE, WASH.—J. L. Stannard, engineer who has been retained to ascertain the feasibility of a power plant along the Cedar River between Landsburg and Cedar Falls, has made his report on four projects as follows: Plan A, 9.4 miles, $2,390,630; Plan B, 12.2 miles, $2,653,950; Plan C, 9 miles, $2,242,300; Plan D, 8.5 miles, $1,919,300.

SEATTLE, WASH.—Council passes resolution directing the city comptroller to receive subscriptions in an amount up to $40,000 for bonds of the municipal railway for building the Ballard extension. These bonds have already been some $12,000 oversubscribed. The request for an injunction against construction of the road was denied and work will proceed.

ASTORIA, ORE.—The Pacific Power & Light Company, because of an increase in business in the vicinity of the Port of Astoria terminals, asks the city for permission to erect a small substation on Taylor avenue at the intersection with the Port thoroughfare. The substation will be 12 by 17 feet. The station will provide power for the Port terminals, shipyards in the vicinity, and other industries now contemplated.

PORTLAND, ORE.—An electric lighting system for Mount Tabor Park may be donated to the public by a public-spirited citizen, according to whisperings heard by Park Superintendent Keyser. He says he has received information that some one, name unknown, proposes to contribute the $10,000 necessary to wire the present lighting poles in the park. The city council, in session as a budget committee, cut out all provision for lighting the park next year.

BEND, ORE.—An 80,000 to 100,000 foot capacity sawmill is to be started this winter at Pringle Falls by the Deschutes White Pine Lumber Company. This will be ready for installation of machinery by spring. It is estimated that 2250 h.p. will be developed to start the mill in operation by the beginning of next spring. Later the entire river is to be diverted from its channel through a canal 1000 feet long with an eight foot fall at the end.

NORTH YAKIMA, WASH.—Final details of the plan for installing a pumping plant, to cost about $200,000, near Prosser for the lifting of water from the Sunnyside canal to water 2000 acres above the gravity flow, were worked out at a meeting of directors of the Prosser irrigation district and R. K. Tiffany, representing the United States reclamation service. The site for the pumping plant has been purchased and as soon as the supreme court passes on the validity of the issue of bonds which the government will take, work on the pump house and distribution system will begin.

KLAMATH FALLS, ORE.—The great dam of the California Oregon Power Company across the Klamath River at Copco, Siskiyou county, California, 45 miles from this city, being completed, the tunnel which carried the waters of the stream during the construction period has been closed. The California Oregon Power Company plans to generate 26,000 horsepower under present development, and an equal amount can be developed by the addition of other units to the power plant. The company plans a smaller dam below the present structure, which will bring the total development to 103,000 horsepower.

## THE PACIFIC CENTRAL DISTRICT

COLTON, CAL.—Sealed bids are being taken by the board of trustees for the annual supply of electric lamps.

ST. HELENA, CAL.—The city trustees have advertised for bids on two new schedules for lighting the streets here.

TRACY, CAL.—The West Side Irrigation District has let a contract to the Lindgren Co., San Francisco, for a pumping plant for $25,789.

PALO ALTO, CAL.—The board of public works has recommended that the council appropriate $200 for placing lights along the creek from Alma street and Palo Alto avenue to the State Highway bridge.

ANGEL CAMP, CAL.—The substation of the Stanislaus and San Francisco Power Company, located at Copperopolis was burned to the ground recently, entailing a loss of $100.000. An overloaded transformer caused the loss.

PORTOLA, CAL.—Owing to the destruction by fire of the electric-light plant of the Grizzly Electric Company the town is without electrical service. The loss is placed at about $7,000. The plant, it is understood, will be rebuilt as soon as possible.

FRESNO, CAL.—The board of trustees have granted the petition of the property owners for the formation of a lighting district for the installation of electroliers, to start at G and Fresno North streets to Kearney Boulevard and on the boulevard to the city limits, one-half mile.

MARYSVILLE, CAL.—The Pacific Telephone & Telegraph Company has filed a petition with the State Railroad Commission asking for permission to operate in Marysville, Yuba county, El Paso de Robles, San Luis Obispo county, Stockton, San Joaquin county, and Watsonville, Santa Cruz county.

PERRIS, CAL.—In the Perris and San Jacinto valleys in southern California the area under cultivation has been greatly increased recently by the use of motor-driven pumps which supply water for irrigation. At present approximately 10,000 horsepower in electric motors is being used in these two valleys.

SAN FRANCISCO, CAL.—Receipts of the Municipal Railway are gradually approaching the normal sums reported prior to the strike of the United Railroads platform men. Last week they ranged from $5965 a day to $7107. During the height of the strike they exceeded $11,500 a day and went at times as high as $12,000.

FRESNO, CAL.—The damage suit of A. L. Dibble against the San Joaquin Light and Power Company has gone to trial in Department Two. Dibble is asking for $5000, the value of grain in the field alleged by him to have been destroyed by fire through negligence of the power company. George K. Ford of San Francisco is representing Dibble, and Short & Sutherland the power company.

PALO ALTO, CAL.—City Engineer Byxbee states that the entire capacity of the power plant is now being utilized during the period of the peak load. It would be impossible to get through the winter with the present equipment, but with the increasing demand on the power plant provision must be made for next year. It is necessary either to install new engines or to arrange for the purchase of current.

SAN FRANCISCO, CAL.—Paradise irrigation district 6 per cent bonds to the amount of $280,000 are being offered subject to prior sale by McDonald & McDonald on a basis to yield 5.60 per cent. The bonds mature serially from 1937 to 1956 and they are part of a total authorized issue of $350,000. The Paradise irrigation district comprises 11,250 acres and is situated in Butte county about 12 miles northeast of Chico. The assessed value of the district for 1917 is in excess of $500,000.

SAN FRANCISCO, CAL.—Bonds of the Imperial irrigation district to the value of $1,500,000 are being offered for sale and bids will be received up to December 18th in the offices of the district in the Masonic Temple Building in El Centro. They are the balance of an issue of $2,500,000 and are of the par value of $1000 each, bearing interest at 5 per cent, payable semi-annually. Bids will be received for the whole issue or any part of it. The bonds are divided into 20 series and fall due from July 1, 1938, to July 1, 1957.

FRESNO, CAL.—The 6100 acres of the Lovelace Reclamation District are now being pumped clear of water by three electrical pumps. A mile and one-half of power line has to be constructed from the Henrietta Station for this project. E. E. Goodwin has signed a contract for the installation of a five-horsepower pumping plant on his eighty acre tract along the Santa Fe just north of Corcoran. Another plant will shortly be installed on the west forty. W. W. Shank has signed up for a five-horsepower plant on his forty acres adjoining the Goodwin place.

FRESNO, CAL.—The San Joaquin Light and Power Corporation, with headquarters at Fresno, has purchased the Merced Stone Company's plant and power lines at Kittredge, Mariposa county, and will extend the power lines to several mining claims, as well as Coulterville. The Merced Stone Company has been generating electricity at its plant for energy at mines and has been securing power from the San Joaquin Light and Power Corporation. The plant was purchased for the purpose of development in Mariposa county and especially to be in a position to furnish power for use at the mines.

FRESNO, CAL.—A gigantic plan to harness the waters of the upper Kings river with power plants to generate sufficient electricity for use in the San Joaquin valley and southern California for years to come and an undertaking that will total many millions of dollars is announced by A. G. Wishon, general manager of the San Joaquin Light & Power Corporation. Simultaneous with Mr. Wishon's announcement of the great engineering feat to develop the water power of Kings river comes the report from the State Water Commission that the Fresno Flume & Lumber Company of Clovis has filed application for 200 cubic feet from Dinkey creek and 400 cubic feet from Big creek for power purposes.

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## THE PACIFIC SOUTHWEST

EL SEGUNDO, CAL.—The Southern California Edison Company has asked for an electric lighting franchise in this place.

WILLIAMS, ARIZ.—A proposition to construct an electric light and power plant for Snowflake and Taylor is progressing nicely.

MANHATTAN BEACH, CAL.—The board of trustees has passed a resolution covering the lighting of the Strand, the improvement to be under way about the middle of December, 1917.

SAN DIEGO, CAL.—The San Diego Consolidated Gas & Electric Company has been awarded contracts by the board of supervisors for furnishing electricity for lighting the Imperial Beach, Normal Heights and Fallbrook lighting districts.

PHOENIX, ARIZ.—The Arizona Corporation Commission has authorized the Phoenix Gas and Electric Company to issue $550,000 bonds, $185,000 of which are to be debentures. The proceeds are to be used for general improvements and extensions.

LOS ANGELES, CAL.—The report of the County Counsel on the proposed contract for a lighting system in Culver City Lighting District has been ordered to be placed on file by the board of supervisors. The contract has been awarded to the Southern California Edison Company.

BENT, N. M.—The Tularosa Copper Basin Mining Company is planning to enlarge its oil reduction mill and install machinery at its mine in Bent. The company also owns a water power on the Tularosa River, where it proposes to build a hydroelectric plant.

SAN PEDRO, CAL.—Major Newton of the quartermaster's department has received instructions from Washington authorizing the construction of more than fifty buildings at Fort MacArthur, involving a considerable amount of wiring and lighting fixtures.

SAN BERNARDINO, CAL.—The Southern Sierras Power Company has in contemplation the construction of additional hydroelectric plants, which will bring their total installed capacity close to 100,000 h.p. The additional developments are made necessary by constant increase of the connected load.

LOS ANGELES, CAL.—An ordinance has been adopted by the city council granting to the Pacific Electric Railway Company a permit to construct and operate a single railroad spur track upon Wilmington and San Pedro road between San Pedro and Wilmington, and upon certain private property in the city of Los Angeles.

PASADENA, CAL.—The city commission has received bids for the installation of a lighting system on Holly street. The first bids received for the work were considered too high, but the two bids received on the second call are even higher than those offered previously. W. A. McNally & Co. bid $3702 and D. A. Templin of Los Angeles bid $3809. The bids were referred to T. D. Allin of the department of public works.

LOS ANGELES, CAL.—Notice is given that an application has been made to the board of supervisors for a franchise, granting the right to construct and for a period of 40 years to maintain and operate a system of pipe lines for transportation of crude oil, gas and water, and to construct and operate a telephone and telegraph system along certain portions of the highways in Los Angeles county. Sealed bids will be received up to December 10th.

SANTA BARBARA, CAL.—The city council is gathering much important information in the move for a municipal lighting system. Reports are being received from Pasadena, Riverside and other cities, where municipal plants or distributing systems are installed, showing big success attained. It is believed that lower rates could be obtained here if the city would install a hydroelectric plant at Mission Tunnel, or even take over the distributing system and buy the power at the city limits.

BEAUMONT, CAL.—Surveyors employed by Los Angeles and Pasadena capitalists are at work between the Whitewater river and Morongo valley on a project for impounding and using a large amount of water in that section. Plans provide for taking water from Baldwin Lake, Arrastre Creek, Pipes Creek, Snow Creek and other streams. It is proposed to dispose of most of the water in the Coachella valley for irrigation purposes. The remainder will be taken to Imperial Valley for domestic use.

LOS ANGELES, CAL.—A total of $1,183,340 has been assigned by the Southern California Telephone Company for consolidating the two systems, and for improvements and betterments to the service, according to announcement of Chas. F. Mason, commercial superintendent. This announcement follows the voting by the directors of $15,680 for small improvements not already covered in the company's budget. These improvements cover the Main, Olive, South, and Wilshire districts, and improvements for private exchange installations.

## INTER-MOUNTAIN DISTRICT

MALTA, MONT.—The new power plant is nearing completion.

DEER LODGE, MONT.—The power plant at Bielenberg & Higgins mine in Bear Gulch is nearly completed.

HOT SPRINGS, MONT.—It is reported that Conrad Smith and F. E. Campbell will install a power plant here.

NEZPERCE, IDAHO.—A 40-horsepower boiler and new Cameron pump have been installed at the Samson property on East Eagle creek.

BOISE, IDAHO.—The case of the Oregon Short Line Railroad vs. Wood River Power Company has been dismissed at the request of complainant.

PLEVNA, MONT.—The installation of an electric light and power plant in Plevna is under consideration. Stater Brothers of Baker are interested in the project.

SALT LAKE CITY, UTAH.—The Mountain States Telephone and Telegraph Company are to have larger quarters here, including cafeteria for girls and clubroom for men.

GRANGEVILLE, IDAHO.—Work is progressing rapidly on excavation for a dam being built by the Grangeville Light & Power Company across the South Fork of Clearwater river.

SALT LAKE CITY, UTAH.—The Salt Lake, Garfield & Western has completed plans for the electrification of its line and work on the project has already been started. The approximate cost of the work will be $250,000.

GREAT FALLS, MONT.—Construction of a new $150,000 unit of the Montana Power Co. has begun. The structure will be of brick, concrete and steel, two stories, with full basement, 90 x 138 feet. The contract has been awarded to Geo. R. Calvert, local.

RENO, NEV.—The Pacific States Telephone and Telegraph Company is completing its new circuit between Quincy and Reno, consisting of four main lines and two local wires. The new line is much shorter. Clio, Mohawk and Johnsville will be on the local circuits.

GRANGEVILLE, IDAHO.—The Grangeville Light & Power Company is building a dam across the South Fork of the Clearwater River, at a point between the present power house and the present dam. It is expected to have the concrete dam completed within six months.

BONNERS FERRY, IDAHO.—The Bonners Ferry Planing Mill, which was recently destroyed by fire, causing a loss of about $40,000, it is reported, will be rebuilt at once. The plans provide for the installation of a 600-horsepower turbine engine directly connected to an engine, with individual motors for various machines in the mill.

PAHRUMP, NEV.—The Western Union Telegraph Company has taken over the telegraphic service along the line of the Tonopah and Tidewater railroad. The service now reaches beyond Ludlow to Death Valley Junction, Silver Lake, Tecop and Zazriskie, Cal., and further connections to Ryan, Riggs, Shoshone, Acme, Cal. and Pahrump, Nev.

OGDEN, UTAH.—Brigham City may have another electric lighting system if the state engineer's office grants the application of the Reclamation Power Co., of which Engineer H. S. Kleinschmidt of Salt Lake City is chief engineer. The company has made application for the appropriation of twenty-eight cubic feet of water in Box Elder Creek to generate electric power.

ALBION IDAHO.—The secretary of the interior has authorized the reclamation service to execute a contract with A. M. Ohl, of Albion, Idaho, for the construction of approximately nine miles of electric transmission line in connection with the Minidoka irrigation project, Idaho. The contract price is $6,245.20. The line will be used to supply electricity developed at the Minidoka power plant to the Melcher Mining & Milling Company of Albion.

TONOPAH, NEV.—The Nevada California Power Co. has completed its large auxiliary electric power plant and given it a thorough test. The generators are operated by steam and the plant will enable the company to supply local mines with abundant power should storms demolish the transmission lines between here and Bishop, as happened last winter. Completion of the plant also insures steady work at the Great Western and West Tonopah mines.

# Ad-itorial Comment

*(More useful information is usually to be found in the advertising pages than in the editorial pages of a technical magazine. Ancient history is tabooed, only the latest and best practice is shown, and no time is wasted in getting to the point. The length of an ad is a measure of the distance in thought between the writer and the reader. Consequently ads are really tabloid articles. This page contains rapid-fire remarks about those advertisers who have something new to say in this issue.—The Aditor.)*

Some one has called machinery the subconscious mind of the world. The greatness of a civilization depends upon its getting machines to do its work automatically. This is the function of the **Electric Controller & Mfg. Co.'s** automatic compensator as a starter of motors. It gives skilled labor an opportunity to do other things. It not only saves labor but actually does the work better.

Universal home needs stand for true thrift in gifts. **Landers, Frary & Clark** have utilized this appeal in some effective selling ideas for the electrical merchant. Their window and counter displays feature the serviceability of electrical gifts in general and Universal devices in particular. The merchant who stocks this line can count on the fullest selling co-operation.

An ingenious adaptation of the Westinghouse air-brake patents has given a wonderfully efficient and satisfactory method of automatic oil stoking. So responsive is this system to changes in load that the firing is better done than by the most competent attendance. Furthermore the machine is always awake, nor does it strike for higher wages. **The Associated Engineering & Supply Co.** have a wealth of interesting facts about the satisfaction given by this system.

For the man who uses tape—and what electrical man does not—some valuable suggestions have been made by the **N. Y. Insulated Wire Co.** Their Grimshaw and Competition brands are advertised on the basis of quality rather than quantity for the money.

**The Pacific States Electric Co.** attract favorable attention by a reproduction of an effective illustration of the electrical Santa Claus. The original is in four colors and is available in several sizes for window and store display, being one of many means whereby the Pacific States Electric Co. helps to move the goods off the counter. The list of what to give electrically is an excellent suggestion as to what to stock so as to meet this year's tremendous demand for practical gifts.

To tell "the reason why" always strengthens conviction. To say that G. E. air circuit breakers are efficient is a fact supported by the **General Electric Company's** reputation. But to prove the fact by explaining the positive locking mechanism substantiates both the fact and the reputation. Facing this advertisement the General Electric Company also shows a beautiful picture of a modern city by night. But without the Type H power and distribution transformers this beauty would cease to exist in most American cities. The picture tells the story better than any amount of text.

Motors make this old world go faster. But in these strenuous days the question is to find a suitable motor in local stock, ready for delivery. The **Garland & Affolter Engineering** Co. have a ready answer to the question with the **Howell** polyphase motor and the **Peerless** single-phase motor.

Electrical dealers might well sell goods by the same arguments which induced them to buy. **The Hurley Machine Co.** have embodied some strong selling talk in their advertisement of the Thor "no trouble" electric cleaner. This striking expression "no trouble" should turn the customer the Thor way every time.

The man who wants to know the last word in distribution line construction should refer to **Hubbard & Company's** advertisement of new Peirce specialties. Here are seven ideas that save labor and material, eliminate trouble and promote safety. This concern has been especially progressive in adopting Pacific Coast suggestions.

The piping installation of a modern power plant is essentially the work of specialists. The **Pittsburgh Piping & Equipment Co.** qualify for the first place in this respect. Their advertisement emphasizes the value of their personal supervision of the work.

**The R. Thomas & Sons Co.** show a 25,000 volt insulator to typify the strength and ruggedness of their product. They have an insulator for every service and are anxious to aid in the selection of one best suited to your needs.

Sprague B X cable is especially adapted to the wiring of finished buildings. It appeals alike to the contractor and the owner. The **Sprague Electric Works** give full details in their Conduit Bulletin No. 49600.

**The National Lamp Works** present an effective illustration of the National Mazda lamp carton together with representation of the twenty labels under which the lamp is sold.

A striking ad and a strong argument is that of Westinghouse jet and surface condensers as published by the **Westinghouse Electric & Mfg. Co.** When a condenser gives such reliable service in remote localities the same dependability will be found wherever installed. As many readers of the Journal are off in the wilds they will find a special interest in studying this proposition.

For the past two months the **Westinghouse Lamp Co.** has been featuring the extensiveness and the intensiveness of its distributing organization. In this issue a two-page spread gives the names of 124 California agents as a concrete example. Each of the other western states is proportionally as well served.

Only a few years ago an induction meter that would not hum was considered a practical impossibility. But now the man who says that a humless meter is impossible is interrupted by the **Sangamo Electric Co.'s** producing it. "Sangamo meters ought to be on your circuit" and they are ready to tell you why.

It is the transformer behind the lamp or motor that counts for continuity and dependability of electric service. The **Wagner Electric Mfg. Co.** tells the reader that they are behind their distributing transformers with that well known apposition, "Wagner, Quality."

**The Cutler-Hammer Mfg. Co.** make a triple play with their 9116 C-H Starting Switch, and it is safe. One move of the operating handle automatically starts a squirrel cage motor, absolutely protects the workman from injury and also protects the motor from burning out. This mechanism is worth looking into—and even the inspection can be made safely.

We are all so used to thinking of storage batteries as being used only in large aggregations for standby service or electric vehicles that we are apt to forget the many other useful applications. In the November 15th issue the **Edison Storage Battery Co.** called attention to three convenient applications around a power plant:—motor testing, remote switchboard control and emergency switchboard lighting. In this issue details are given of a meter testing set made in the West for the use of Western metermen. Subsequent issues will give detailed information regarding other applications.

A new face is welcomed among the Journal's family of advertisers this issue in the person of the **American Electrical Heating Co.** of Detroit. They show fourteen different kinds of electric heating devices, all backed by a quarter century's manufacturing and sales experience. Emphasis is placed upon the necessity for immediate orders to care for the holiday trade. Several Pacific Coast jobbers have ample stocks.

The unique suggestion of really protecting a motor with a simple fuse is made by the **Century Electric Company** because the Century motor starts on the repulsion principle and "keeps a-running" as an induction motor, thus minimizing the maximum current demand. This feature also makes this motor especially desirable from a central station standpoint.

**"Okonite"** has been so widely advertised that it is today synonomous with the standard for rubber insulation. This is the true essence of success — to synomize a name and a product.

More recent improvements have been made in insulator design and manufacture than people realize. They are detailed in a late supplement to the **Locke Insulator Mfg. Co.'s** "Insulator Book," which is in itself the most practical treatise yet written on the use and abuse of insulators. Every electrical man should own his own copy.

The **Ward Leonard Electric Co.** devote a full page to the good points of their resistance unit. Some one may say that a resistance unit is only a mere detail, but the wise man knows that it takes perfected details to give perfect work. Here is a perfectly insulated unit of specially perfected resistance wire adaptable to any desired resistance or capacity for any purpose. Truly, perfection is the only standard worth striving for.

The **Electric Storage Battery Co.** suggest many purposes to which storage batteries are applied and show the special adaptability of some one of the many types of Exide cells to each need. The Exide cell excels in insuring the greatest service at the least operating cost.

The oft-repeated statement that the "West is different" is borne out by the **Federal Sign System (Electric)** which announces that Secretary Garfield's order regulating the use of electric signs does not concern Western hydroelectric plants. The real purpose of the order is to help liberate facilities that are tied up in the transportation of coal so that other articles may be moved expeditiously.

To paraphrase,—Weston is to an indicating instrument what sterling is to silver. This name of the **Weston Electric Instrument Co.**, like any other well-advertised name, gives unmistakable evidence of their responsibility for the quality and uniformity of their product.

"Macomb" on electrical porcelain, through the efforts of **Baker-Joslyn Company**, is fast becoming standard on the Pacific Coast. Their advertisement in this issue shows a commendable appreciation of the value of white space in display advertising.

In these days of much idle conversation about conservation actual instances of real saving are most refreshing. The **Westinghouse Electric & Mfg. Co.** cites the increased loads that can be carried on present distribution systems by the mere addition of Westinghouse feeder regulators. They illustrate their argument by a noteworthy installation of thirty large units in Baltimore. A feeder regulator frequently makes additional generating and distributing capacity unnecessary. This is genuine conservation.

**CHANGES OF ADVERTISING COPY** should reach this this office ten days in advance of date of issue. New advertisements will be accepted up to noon of five days prior to the dates of publication, which are the first and fifteenth of each month. Where proof is to be returned for approval, Eastern advertisers should have copy reach this office at least thirty days in advance of date of issue.